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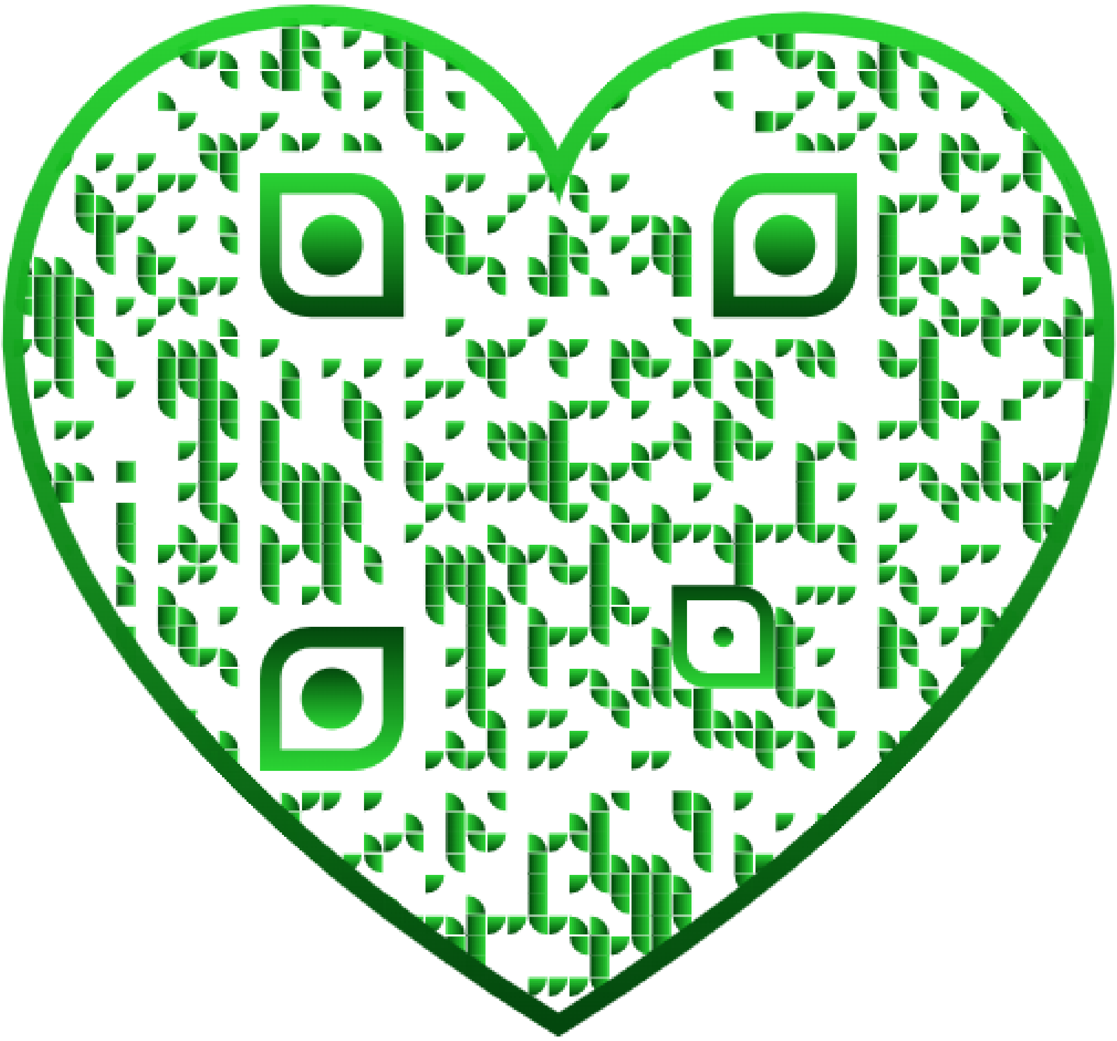

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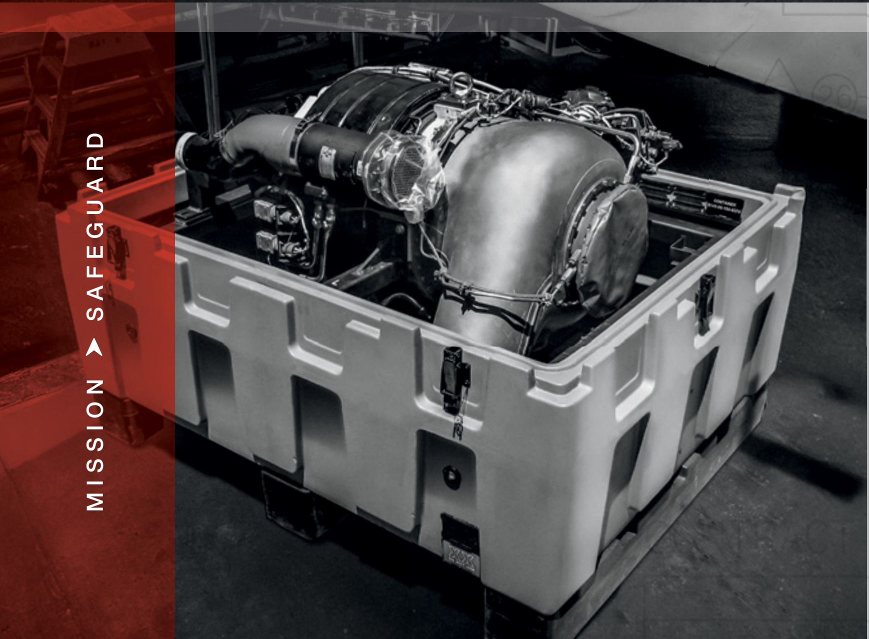
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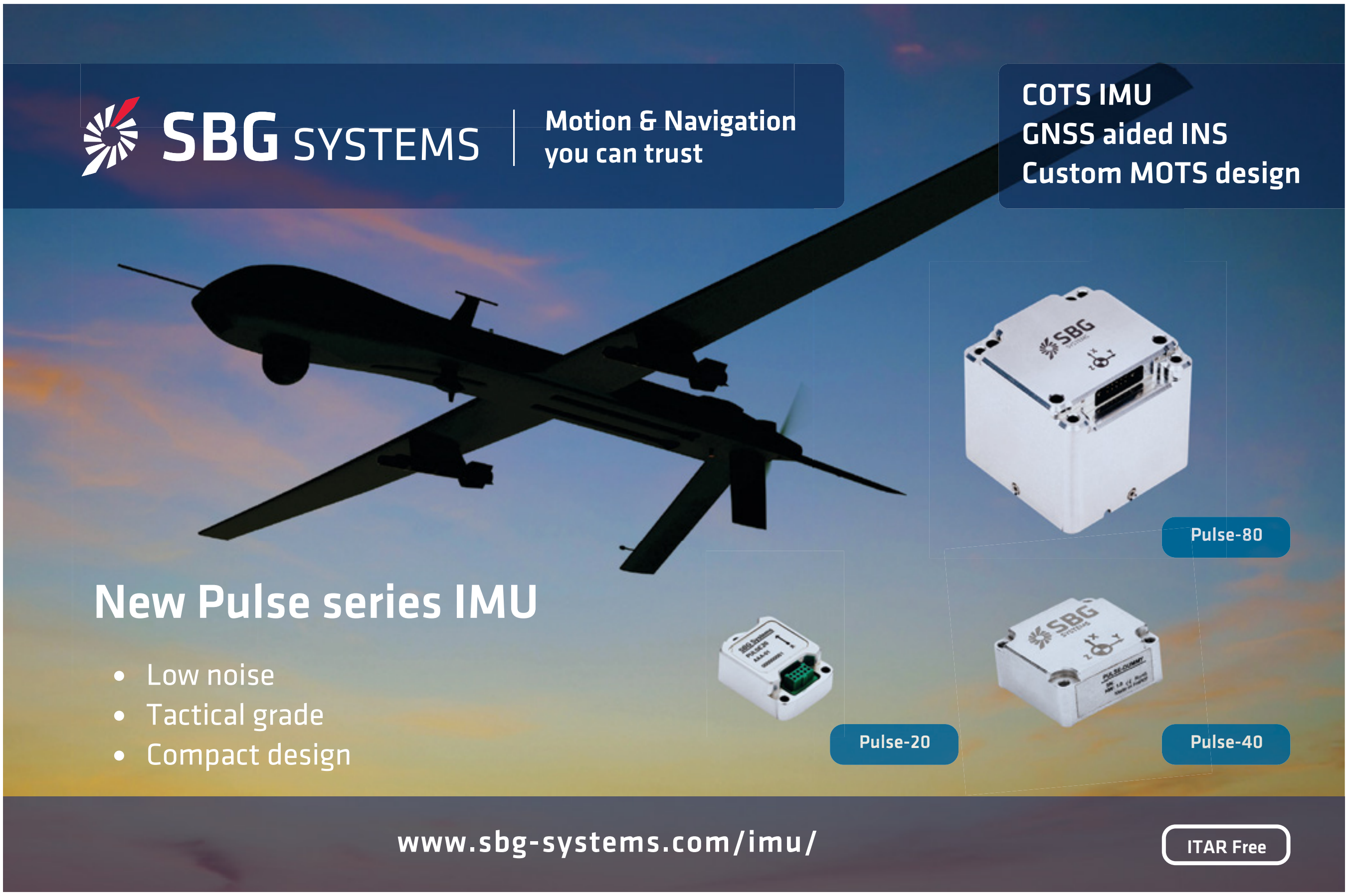
ON THE COVER

2025 marks the 35th year of the Nadcap accreditation program for quality assurance in aviation, defense and space manufacturing processes. To learn more about the Nadcap program, read the feature article on page 10.

(Image: Starush/Adobe Stock)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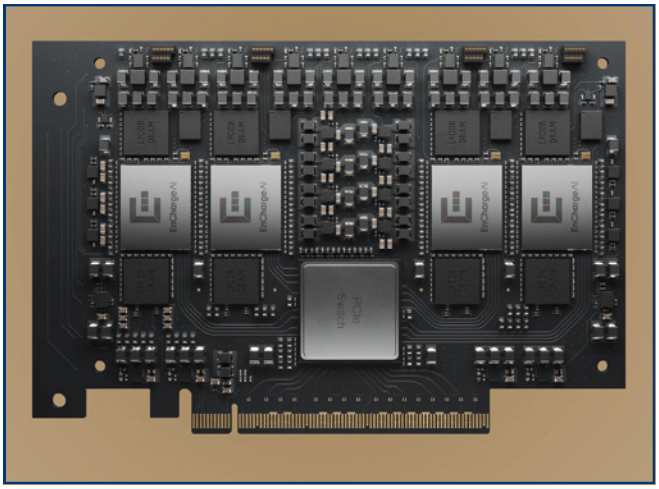

In-Memory Computing Chip Is a Processing Breakthrough for On-Device AI Applications

In this episode, EnCharge AI CEO Naveen Verma joins us to discuss the launch of the EN100 AI chip, which was developed with a scalable analog in-memory computing architecture.

https://www.mobilityengineeringtech.com/ podcast/1025/in-memory

A Quantum Accelerated Digital Twin for Aerospace and Defense Simulation

During this episode, Abhishek Chopra, CEO and founder of quantum simulation startup BQP, discusses their strategic collaboration with the U.S. Air Force Research Laboratory to advance mission-critical modeling with quantum computing.

https://www.mobilityengineeringtech.com/ podcast/1025/quantum-digital-twin

Microchip's New Processor Enables Scalable Computing Performance

As we continue to look at the future of military computing, this episode focuses on how Microchip's new PIC64 microprocessor portfolio could deliver a generational leap in embedded processing performance. Bill Dillard, Senior Manager of Aerospace and Defense at Microchip, discusses how this breakthrough technology could shape the future of military computing.

https://www.mobilityengineeringtech.com/ podcast/1025/microchip

Piasecki's KARGO UAV Program: Enabling Uncrewed Logistics

After acquiring the KARGO UAV program from Kaman Air Vehicles, Piasecki Aircraft Corporation has launched the KARGO II, a medium-lift autonomous UAV with a max payload capacity of over 1,500 lbs. In this episode, CEO John Piasecki discusses the program's future and opportunities for partners and suppliers.

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INSIDE STORY

Mercury Systems is a technology company that delivers mission-critical processing power to the edge. Combining technologies and expertise developed for more than 40 years, the Mercury Processing Platform offers customers a unique advantage to unleash breakthrough capabilities, enabling customers to turn data into decisions with standard products and custom integrated solutions. In this interview, Brad Bruce, Director of Program Management at Mercury Systems, discusses technology trends and their influence on our ROCK3 airborne mission computer.

***Aerospace & Defense Technology (A&DT):* Recent U.S. Department of Defense directives emphasize the need for faster and more agile delivery of capabilities to the warfighter. How is this shift impacting mission computing requirements?**

Brad Bruce: Having served as an Army aviator for over 20 years, I can say firsthand that we didn't see new capabilities arrive very often during my time in uniform. The pace of technological advancement was slow compared to the evolving threats we were facing. Today our adversaries are moving much faster both in terms of capability development and deployment. I fully agree that the Army, along with the other service branches, needs to accelerate its ability to adopt and field new mission-critical technologies to keep pace and maintain operational advantage.

***A&DT:* How are evolving operational demands and the push for faster capability delivery reshaping mission computing requirements?**

Bruce: Today's mission computing systems need to be far more open and scalable than in the past. That shift is being driven by a clear need to close strategic capability gaps faster and more effectively. Sometimes traditional, closed systems simply can't support at the speed modern threats require.

Open architectures like SOSA are helping to remove long-standing barriers by enabling greater interoperability, faster integration of emerging technologies, and more flexibility across platforms. Scalability is just as critical. Whether it's a crewed aircraft or an autonomous drone, the underlying mission computing system must be adaptable enough to meet varying size, weight, and power constraints while still delivering the performance needed at the edge.

Openness and scalability are no longer optional. They're essential for modern defense platforms. They allow us to keep pace with change, integrate AI and other advanced capabilities faster, and ultimately deliver the right technology to the warfighter when and where it's needed most.

***A&DT:* Which areas present the most complexity when implementing these solutions?**

Bruce: One of the biggest challenges is aligning around open standards like SOSA and the broader principles of MOSA (Modular Open Systems Approach). While there's clear momentum, implementing these standards across a wide range of platforms and programs still requires significant coordination, not just technically, but culturally and organizationally. Another challenge is that no single company has the complete solution. That's why close collaboration with teaming partners is so critical. Leveraging each organization's strengths, whether in processing, RF, security, or software, enables us to deliver integrated mission solutions much faster than going it alone.

***A&DT:* With increasing data demands from sensors and AI workloads onboard aircraft, what are the challenges and advantages of transitioning from distributed to centralized computing architectures in mission-critical airborne systems?**

Bruce: Artificial intelligence is early in its adoption and has the potential to fundamentally reshape mission computing by driving the need for faster, more flexible, and more intelligent onboard systems. As AI workloads are likely more complex, handling everything from sensor fusion to real-time threat detection, airborne platforms need a highspeed digital infrastructure that can keep up.

That's why we're focused on developing our ROCK3 systems that support high-speed digital backbones, aligned with standards like SOSA and MOSA enabling rapid integration of AI capabilities, while also ensuring interoperability and upgradeability across multiple platforms.

***A&DT:* How is artificial intelligence reshaping mission computing in today's airborne platforms, and what breakthroughs do you see on the horizon that will drive greater autonomy and adaptive decision-making in flight?**

Bruce: I believe AI and autonomous capabilities are going to be a game changer for airborne mission computing. As platforms become more complex and data-rich, we're seeing real challenges around pilot workload. AI has the potential to play a critical role in offloading routine or data-intensive tasks, enabling faster, more informed decision-making, and ultimately enhancing mission effectiveness.

Looking ahead, autonomy will become increasingly essential, especially for contested environments and where manned platforms are cooperating with unmanned systems. We look forward to working with industry leaders and aviators to further shape our ROCK3 mission computing architectures to be designed to support safe, secure, and certifiable AI and autonomous operations. That includes everything from real-time data processing and sensor fusion to partitioned architectures that ensure AI systems operate reliably under strict safety constraints.

For more information, visit Mercury Systems at **mrcy.com/rock3**.

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Nadcap at 35

Still Defining Excellence in Aviation, Defense and Space Manufacturing

Celebrating its 35th year, the National Aerospace Defense Contractors Accreditation Program (Nadcap) continues to advance quality assurance and regulatory compliance for aviation, defense, and space OEMs and suppliers. This article summarizes how Nadcap accreditation works, its benefits for manufacturers, and its role in expanding additive manufacturing through industry-wide consensus.

The Nadcap program was first established in 1990 by a small group of aerospace and defense OEMs. Their goal was to create an accreditation initiative that provides a common approach to auditing the manufacturing and production processes used by companies supplying parts, components, structures, and services to major aerospace and defense OEMs. This foundation set the stage for Nadcap's continued focus on quality assurance and regulatory compliance in the industry.

How does the accreditation and auditing program work?

The criteria guiding the supplier audit process are organized and defined by a council of aerospace and defense "subscribers," who require audits based on these standards for supplier compliance to ensure part quality and performance. These "subscribers" are primarily lead-

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At the 2025 Paris Air Show, the Performance Review Institute displayed examples of Nadcap accreditations earned by aerospace suppliers. (Image: PRI)

ing aerospace and defense companies globally.

Richard Freeman, Principal Staff Engineer at Performance Review Institute (PRI) — the organization that administers Nadcap certification audits — described the industry reasons for the establishment of the program during a May 2025 webinar hosted by the America Makes - National Additive Manufacturing Innovation Institute.

"It was pulled together by major OEMs in the aerospace industry, and the main reason for that was to have a common approach to auditing. The goal was to reach agreement on a unified audit method among multiple OEMs. We describe these OEMs as subscribers because they subscribe to the Nadcap program. The subscribers create all the criteria for special processes," Freeman said. "When they audit their supply base, which is often shared by many subscribers, there is a common audit for processes like heat treatment, welding, NDT, chemical processing, and others. This approach really helps reduce the number of audits a supplier faces from different OEM customers."

According to Freeman, with the addition of Honda Aero and Honda R&D earlier this year there are now a total of 65 OEM subscribers managing the audit criteria for the Nadcap program.

To demonstrate the prominence of Nadcap as a global standard for quality assurance in aerospace and defense manufacturing, below is a partial list of significant organizations that are Nadcap subscribers:

• BAE Systems • General Dynamics • Mitsubishi • Boeing • Gulfstream • Raytheon • Bombardier • Honeywell • Safran • Embraer • L3Harris • Textron Aviation • Collins Aerospace • Leonardo • Northrop Grumman • NASA • ST Aerospace • Spirit Aerosystems • Liebherr Aerospace • Thales • Rolls-Royce • GKN Aerospace • Dassault Aviation

The subscribers have established audit criteria for 26 total accredited manufacturing processes, each considered critical by the aerospace and defense industry.

Two recent processes additions to the audit criteria are counterfeit mitigation, and cybersecurity of physical products, according to Freeman.

Below is a list of the different manufacturing processes that the Nadcap program provides for aviation, defense and space manufacturers:

• Aero Structure Assembly • Materials Testing Laboratories • Aerospace Quality System • Measurement & Inspection • Chemical Processing • Metallic Materials Manufacturing • Coatings • Non-Destructive Testing • Composites • Non Metallic Materials Manufacturing • Conventional Machining (Special) • Non Metallic Materials Testing • Elastomer Seals • Nonconventional Machining • Electronics – Cable & Harness • Sealant • Electronics – Printed Boards • Surface Enhancement • Electronics – Printed Assemblies • Welding • First Article Inspection • Fluid Distribution Systems.

The three types of audits that are most in demand are chemical processing (which involves monitoring and managing chemical reactions in industrial processes), heat treatment (a process used to alter the physical and sometimes chemical properties of materials), and non-destructive testing (a method for evaluating the properties of a material or component without causing damage). Freeman estimates that globally, there are over one thousand audits performed per year for these processes. The program provides Nadcap accreditation for an average of more than 4,300 suppliers annually. In 2024 there were 6,224 Nadcap audits conducted in 53 countries.

PRI's 2019 "Supplier Satisfaction Survey" previously found that 70 percent of suppliers participating in the program have reported a decrease in product defect rates.

How is Nadcap Helping Suppliers?

In recent years, aviation, defense, and space companies have demonstrated the Nadcap program's global impact by publicizing their successful audits and new accreditations. Thirty-five years after its development, Nadcap remains a valued certification to showcase product and service quality.

Liebherr Aerospace and Transportation recently provided an example of

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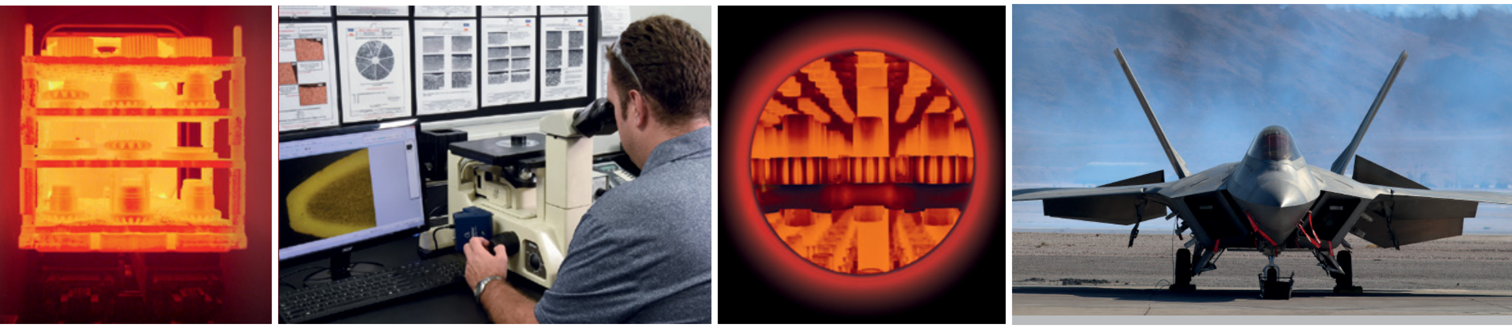

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this. Based in Toulouse, France, the company manufactures air management systems, flight control and actuation systems, gears and gearboxes, and electronics. In a January 2025 LinkedIn update, the company described earning Nadcap Gold Status.

OPEN MEETING
Nadcap
Administered by PRI
Counterfeit Mitigation Task Group
SALÓN VIENA
Nadcap 35
Counterfeit Mitigation

In July, PRI administered the inaugural meeting of the Nadcap Counterfeit Mitigation Task Group - a major step forward in addressing one of the most pressing issues in aerospace safety. This group will focus on developing audit criteria and best practices to identify and prevent counterfeit materials in the supply chain. (Image: PRI)

“The successful Nadcap audits regarding the recertification of chemical processes within the production department took place at Liebherr-Aerospace Lindenberg GmbH, Lindenberg (Germany) and Liebherr Aerospace Brazil LTDA in Guaratinguetá (Brazil),” the company said. “With this result, we have achieved Nadcap Gold Status in Lindenberg, which is associated with an extended audit interval of 24 months. Furthermore, we were able to extend the Silver Status in Guaratinguetá, which is associated with an extended audit interval of 18 months. As the review and assessment is done objectively and transparently by PRI, our progress towards business excellence is well traceable also for third parties.”

Michelin Group company CDI Products recently achieved Nadcap accreditation and explained its significance in an April press release. The Houston, Texas-based company offers in-house engineering, material development, and manufacturing. Its full vertical integration spans from raw materials to finished products, according to its website. CDI Products provides polymer and graphite products, including seals, bearings, wear and functional components, for a wide range of aerospace and defense OEMs.

In an emailed statement to *A&DT*, Steve James, CDI’s Commercial Director of Aerospace, explained that transitioning from individual customer audits to centralized Nadcap audits presented both a substantial challenge and a unique opportunity.

“A single audit can serve as a substitute for multiple audits tailored to individual customers. The standards are universally recognized and often more rigorous. The outcome, whether positive or negative, carries significant implications since the accreditation is visible to all subscribing aerospace clients,” James said. “Calibration is essential for maintaining equipment precision and ensuring compliance with aerospace regulations. While CDI has always calibrated its equipment, our recent review of post-cure oven calibration against the specifications in AS6414 Appendix A introduced new challenges for the team to meet specifications.”

James said calibrating their post-cure oven was insufficient to meet Nadcap’s rigorous standards. They also had to verify the calibration method itself, necessitating closer collaboration with their external calibration provider.

As part of its ongoing investment in the aerospace market, CDI is expanding its Arylast™ material portfolio, offering a complete range of high-performance elastomers engineered for extreme environments. Each new material is created following Nadcap-compliant processes.

“Our Nadcap certification shows customers that every new material we create adheres to the same stringent, industry-recognized quality standards as our current offerings. This certification also assures that new Arylast materials are designed, tested, and qualified under highly controlled and reliable processes. This ensures consistent performance and compliance with demanding aerospace and industrial requirements,” James said.

The Nadcap accreditation ensures their quality management system takes corrective action, minimizes risk, and improves processes, all verified by independent recurring audits. James believes the certification provides a faster route to material and sealing solution qualifications versus non-accredited competitors. While the audit validated their current systems’ performance, CDI is using the results for ongoing improvement.

“A prominent illustration is our deflashing process. The team recognized areas for improvement in efficiency and product quality during the evaluation. Consequently, CDI is investing strategically in advanced deflashing equipment that enhances throughput and overall productivity, while also delivering a more consistent and higher-quality finished product. As we progress, these enhancements will guarantee that our materials consistently meet or surpass customer expectations while upholding the stringent standards confirmed by our Nadcap certification,” James said.

Expanding Additive Manufacturing Oversight

In 2025, PRI is expanding its oversight of additive manufacturing (AM), although this critical manufacturing process is nothing new for Nadcap. The

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AddQual is a Derby, UK-based company that provides a wide variety of manufacturing services for the aerospace industry, including the development of turbine blades. In May, the company shared this photo celebrating the completion of its latest Nadcap audit for 3D Structured Light (3DSL) with zero major and zero minor findings. (Image: AddQual)

Nadcap
Administered by PRI

Teijin Carbon is a subsidiary of the Teijin Group, specializing in the production and development of carbon fibers and carbon fiber-based materials for aerospace and several other industry verticals. Teijin Carbon Europe shared this image in July celebrating its passing of the Nadcap audit for accreditation for non-metallic material manufacturing and testing. (Image: Teijin Carbon)

Nadcap program first added an additive manufacturing focus to its Welding Task Group in 2014. In 2023, an Additive Manufacturing Task Group was added to the accreditation program. The group is chaired by Dave Abbott, a principal engineer at GE Aerospace and Freeman, PRI's principal engineer.

Nadcap's AM Task Group currently covers Laser and Electron Beam Powder Bed Fusion (PBF). Powder Bed Fusion is an additive manufacturing (AM) process where a heat source, such as a laser or electron beam, fuses layers of powdered material to build parts. This process is denoted AC7131/1. A newly revised audit criteria was published for new PBF audits in August, according to an update on the PRI website. The sub-team that developed the updated Audit Criteria included GE Aerospace, GKN Aerospace, Raytheon, General Atomics, Safran, BAE Systems, Rolls-Royce, GF Additive, and Divergent Technologies. The revision reflects increasing industrial maturity and tighter process expectations, according to PRI.

PRI has also published Audit Criteria for Directed Energy Deposition (DED), denoted AC7131/2. This includes Laser powder DED, Laser wire DED, Electron beam wire DED, and Plasma-assisted and Gas Metal Arc wire DED processes. Audits will begin in October 2025, with several suppliers preparing for audits specific to DED processes. The sub-team that developed this document included Boeing, Spirit, Rolls-Royce, General Atomics, GE Aerospace, GKN Aerospace, Raytheon, Norsk Titanium, and RPM Innovations.

In the non-metallic segment, PRI is conducting its second Task Group ballot of the Audit Criteria for powder bed fusion of non-metallic materials, a 3D printing process also known as Selective Laser Sintering (SLS). This ballot is denoted AC7131/3. The sub-team responsible includes Boeing, Safran, Airbus, General Atomics, Textron, Raytheon, Leonardo, and Materialise. 3D Systems will train Additive Manufacturing (AM) auditors in the SLS process at the October 2025 Auditor Conference in Pittsburgh.

This article was written by Woodrow Bellamy III, Senior Editor, SAE Media Group (New York, NY), with material supplied by the Performance Review Institute. **For more information about Nadcap, visit www.p-r-i.org/nadcap.**

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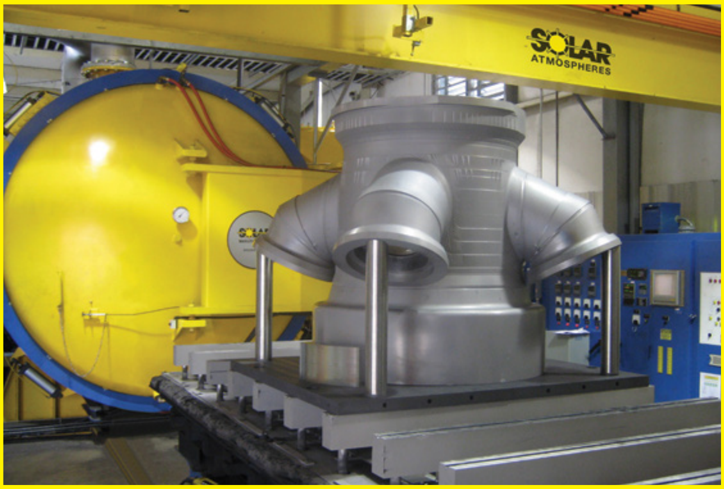

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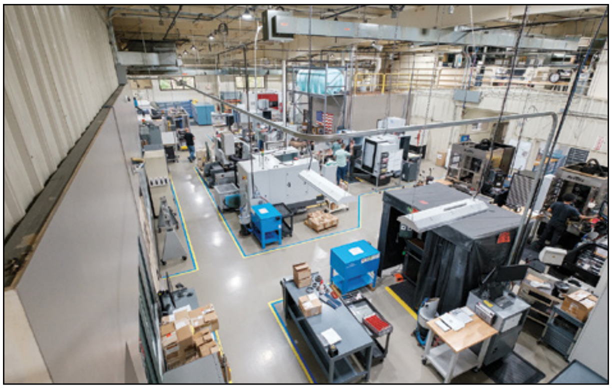

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AEROTECH Processing Solutions

Aerotech Processing Solutions
57 Wood Street
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sales@aerotechprocessing.com
www.aerotechprocessing.com

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Aerotech Processing Solutions is a Nadcap-certified, special processing facility serving the aerospace, defense, and other high-tech industries. We provide an extensive range of processes in our 30,000-square-foot facility.

The Aerotech advantage is our people. Our team is led by highly trained and experienced professionals who are dedicated to meeting and exceeding our customer requirements. In today's world, that means high quality at a competitive price with fast turnaround and excellent service.

We presently hold Nadcap approvals for Aerospace Quality System, Chemical Processing, and NDT (with Merit). We are also ISO 9001 and 13485 certified.

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Target Markets

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Products/Services Offered

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As a leader in vacuum heat treating, brazing, and aluminum heat treating, Hy-Vac Technologies, Inc. offers expertise in thermal processing. Our commitment to quality has made us a trusted supplier in the aerospace, military/defense, automotive/heavy truck, and medical industries. We are Nadcap accredited and hold many prime aerospace approvals. We are continuously looking to add services to accommodate our customers. Current projects include a vacuum furnace installation, and a new tensile testing lab.

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Target Markets

Our target markets are Aerospace, military/defense, and automotive.

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High Performance Enclosure Systems for Aerospace and Defense Applications: *Preparing for What's Next*

As mission-critical systems demand more processing power, real-time data movement, and multi-domain interoperability, rugged embedded systems are being transformed. Today's military and aerospace applications increasingly demand the merging of AI computing, enhanced sensor interfaces, and cybersecurity — all under harsh environmental conditions.

At the heart of this evolution is the 3U OpenVPX form factor, a modular, compact, and ruggedized hardware standard and increasingly the SOSA aligned subset of the architecture. However, next-generation systems need to go further: supporting higher bandwidth, better thermal efficiency, improved security, while maintaining multi-vendor interoperability and long-term sustainability. We'll discuss some of today's enclosure solutions as well as emerging technologies.

Approaching Performance Boundaries

Cooling an embedded computing system becomes more challenging every year. With today's AI-centric processors, the thermal loads are ramping up faster than ever. While some of these 3U OpenVPX modules such as Xeon D or some UltraScale+ based are in the 50W-75W range, other GPU and high-end FPGAs can hit the 175W range. Cooling 600W in an Air Transport Rack (ATR) with airflow over the fins is certainly possible in medium-sized enclosures. In fact, Figure 1 shows a 10+2 slot 5/8 ATR for 3U OpenVPX/SOSA cooling over 800W. But there are physics limitations to the cooling, especially meeting environmental thresholds which may be up to 70 °C or higher. Additionally, there is often the desire to reach high altitudes where there is less air available for thermal management of the system.

There are tricks of the trade to enhance or balance out the cooling in the system including special alloys, heat-pipes (which tend to be more effective at spreading the thermal load versus dissipating much heat), etc. But, to make a significant difference, we need to incorporate other methods. Liquid cooling is an obvious choice, but it is often a last resort with the complication, expense, and other hurdles involved. So let's put that aside for now.

So, given a certain amount of airflow available, instead of focusing on the materials, etc., perhaps we can utilize the existing air more efficiently. In most ATRs with supplemental airflow, the VITA 48.2 module conducts the heat to the enclosure surfaces (primarily on one side) and that heat radiates to fins which elongate the surface area, allowing more

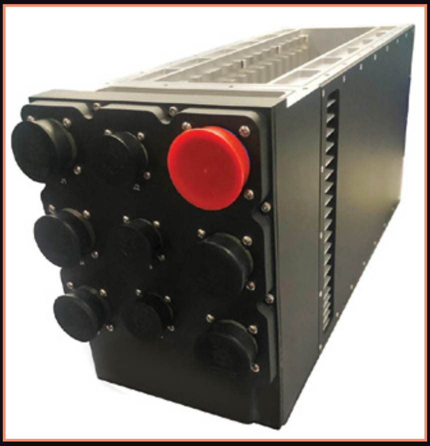

Figure 1: With fins through the sidewalls, airflow can pass over the fins to help cool them, without exposing the internal boards to direct air. This is a less-complex and a cost-effective approach for enhanced enclosure cooling. (Image: Pixus Technologies)

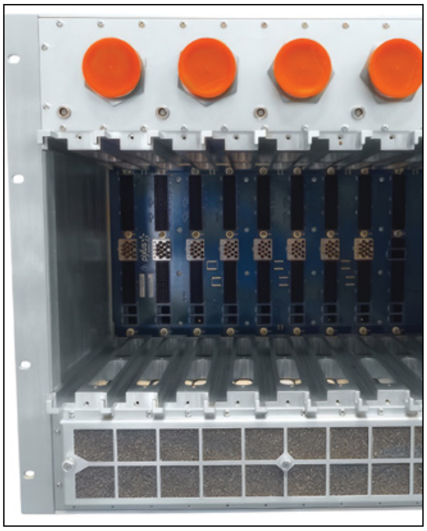

Figure 2: Leveraging VITA 48.8 for Air Flow Through (AFT), the modules, these chassis can provide over 200W of cooling per slot for OpenVPX-based systems. (Image: Pixus Technologies)

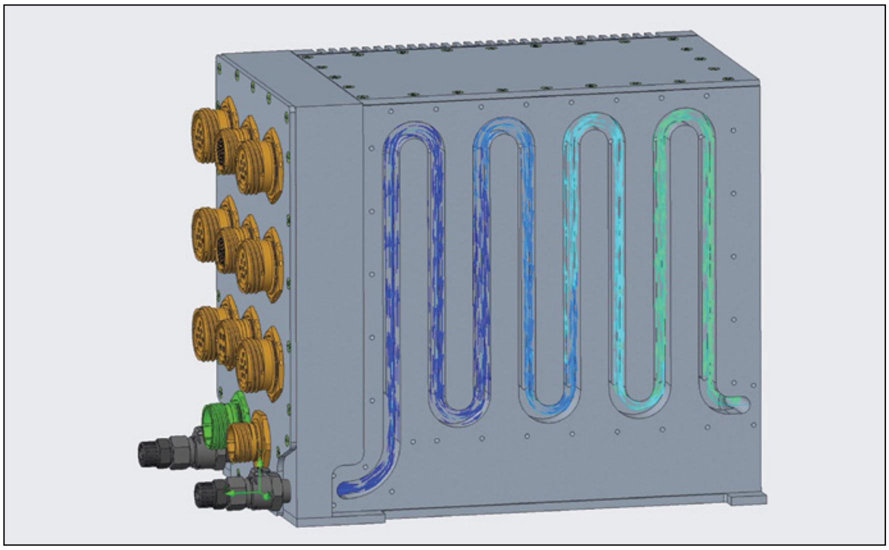

Figure 3: As systems increasingly use extremely high-performance processors, liquid cooled enclosures will become more prevalent. Variations include liquid through the sidewalls as shown in the Figure or with VITA 48.4 versions with liquid through the modules themselves. (Image: Pixus Technologies)

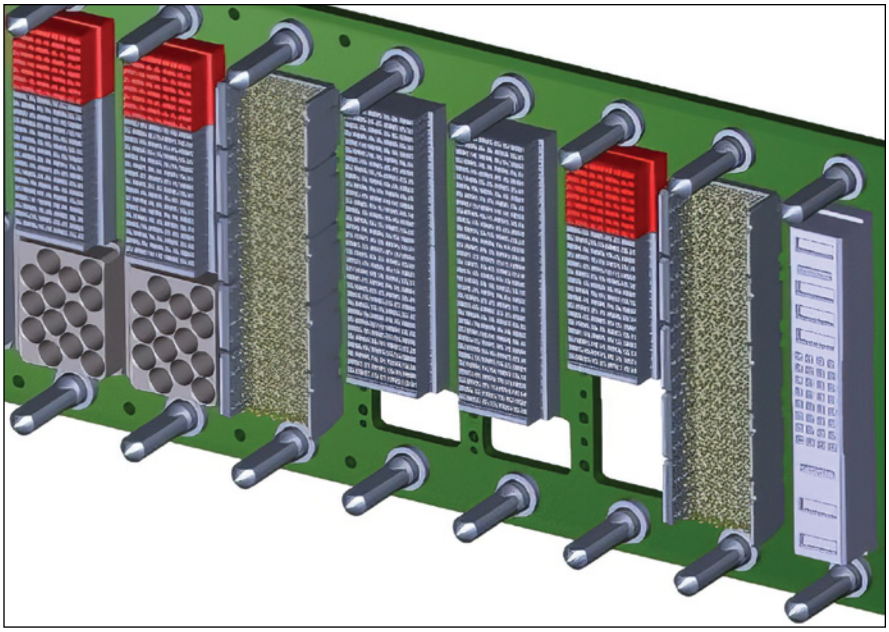

Figure 4: VITA 91 slots that double the density of an OpenVPX slot are a way to maintain compatibility of the architecture while offering up to 56Gbaud/s speeds across a channel. (Image: Pixus Technologies)

air/surface. But what if we can have that air go directly through the module itself, without compromising the electronics in a harsh environment?

An emerging approach for cooling is Air Flow Through (AFT) the module via the VITA 48.8/48.5/48.9 standards. Actually, this concept has been around for a while. Figure 2 shows a Pixus chassis developed in 2019 that leverages VITA 48.8 for special-sized OpenVPX boards. With the airflow through the individual cards, the cooling performance could reach a 50 percent improvement or more (estimated from like modules with similar processors in both VITA 48.2 and 48.8 formats). However, there is a cost associated with this approach in that the module slot pitch often needs to increase. VITA 48.8 for example includes 1.0", 1.2", 1.5" size modules. While 1.0" is the slot pitch of a typical 3U or 6U OpenVPX board, currently the more common modules are 1.2" or 1.5"

As mentioned, liquid cooling is an option with liquid through the sidewalls as shown in Figure 3 or via VITA 48.4 where the liquid flows through the module itself. While AFT is expected to significantly boost thermal performance, the push for higher speeds and performance continue to drive up heat loads. As we've seen, there are mechanical/thermal challenges, but there is a whole other side of being able to handle the speeds across the backplane.

The Road to 400GBASE-KR4 and Beyond

Military and aerospace systems are now deploying AI algorithms to process video, radar, or acoustic data in real time. This requires significant processing horsepower — CPUs, GPUs, FPGAs, and AI ASICs — packed into these small 3U cards. The next generation of processors will require more real estate, however. There is a reluctance to go all the way up to the 6U module size for all types of avionics, ground vehicle, and other

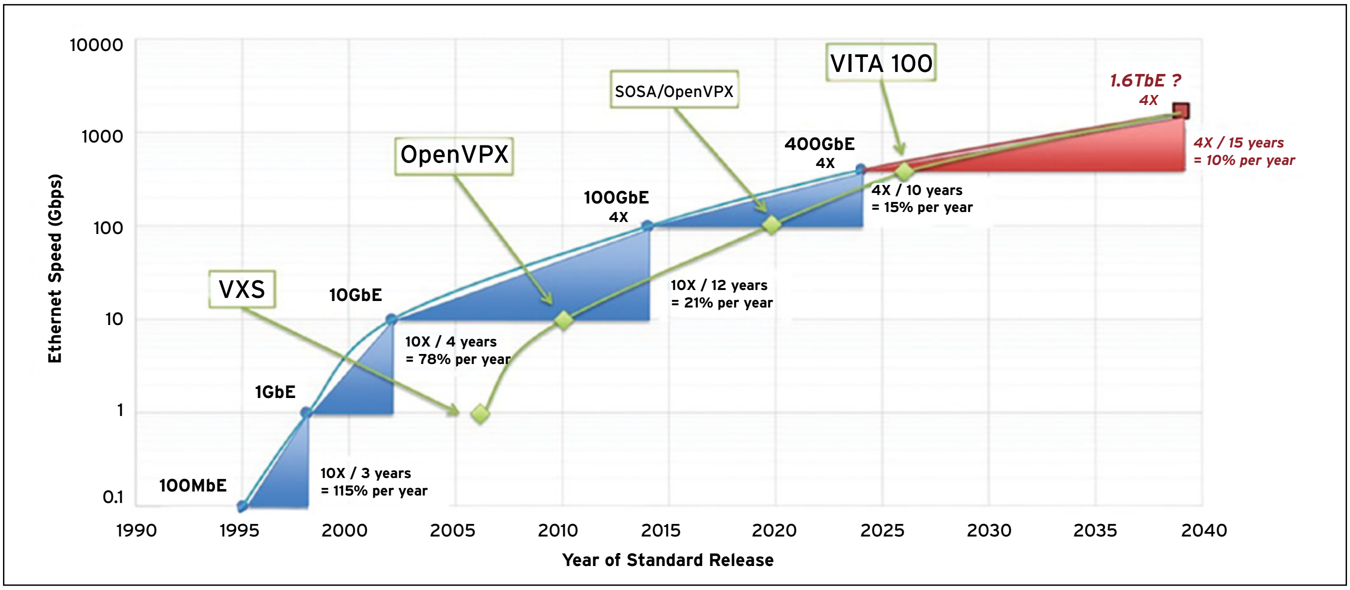

Figure 5: The chart shows the performance evolution of VITA architectures including VITA 100 future use. While OpenVPX will continue to advance for decades to come, VITA 100 will go to a new connector type to provide a leap in performance. (Image: Leonardo/DRS)

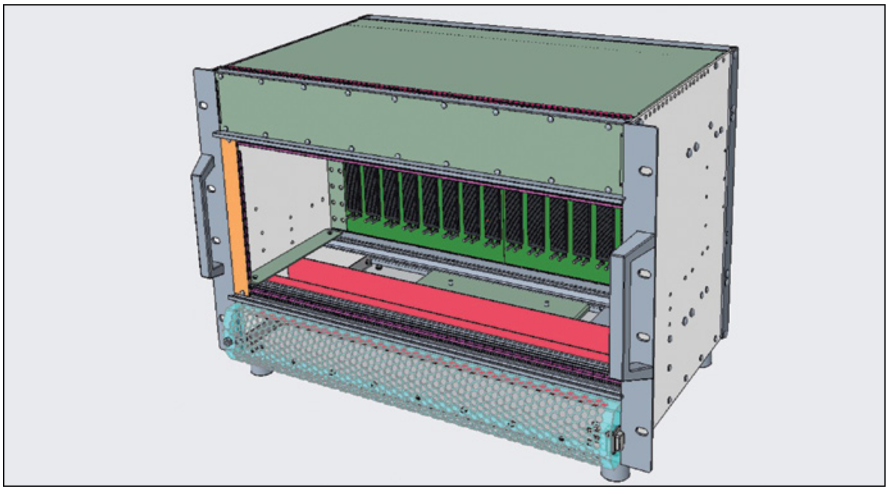

Figure 6: While VITA 100 is still in draft, it is possible to utilize some modular enclosure systems that are highly versatile. The PixCool chassis in the figure shows the enclosure supporting 4U boards – a new size that will be utilized in VITA 100. (Image: Pixus Technologies)

applications where there just is not the space to double the size. So, how do we go faster than the traditional limit of 100GbE speeds in the OpenVPX connector (with 4x lanes of ~ 25G signals)?

One path is to increase the density of the connector, without "breaking" the interoperability of the system. This can be achieved via the VITA 91 standard, which is a double density version which allows 56G through the channel. Figure 4 shows a 3U OpenVPX/SOSA aligned backplane design incorporating the VITA 91 connectors for higher density in the switch slots. This solution is a nice stepping-stone to higher speeds, but there is still the goal of much higher bandwidth. The next step is to not only double the density, but increase the baud rate which can be achieved in a new connector solution.

Leveraging the double density and improved signal performance/density learned in VITA 91, VITA 100 is the next evolution in VITA performance. See Figure 5 for a chart showing the performance horizon for various VITA-based technologies. The emerging VITA standard promises 2x the baud rate, 2x the density of OpenVPX (like VITA 91), and enables 2 bits/baud rather than just 1 bit/baud. So, it's also more efficient in encoding.

The result is 8x the performance of the typical OpenVPX connector. Many of the emerging leading-edge chipsets require more board real-estate than a 3U OpenVPX board can support. Therefore, a 4U module size has been introduced, with approximately 60 percent more surface area. This will require a whole new generation of enclosure systems to support the 4U form factor. But for testing/development, utilizing a modular enclosure approach, we don't need to start from scratch. Figure 6 shows a PixCool chassis that supports 4U modules in various slot pitch sizes. So, once the VITA 100 is fully developed, this type of solution can quickly be utilized with the new backplane designed to the emerging standard.

The new architecture is intended to support modular payloads, high-speed optical/RF I/O, and high-performance compute accelerators. It is likely to include integrated chiplets, co-packaged optics, and AI-oriented bus protocols. To support potentially power-hungry components, VITA 100 will also more than double the power capacity. If a 48VDC version is incorporated, it could theoretically support over 1000W. But those modules would likely necessitate liquid cooling.

While VITA 100 will not be backwards compatible, it will leverage many features of OpenVPX, including many of the same routing profiles or elements therein. VITA 66 and VITA 67 for RF and optical through the backplane are already enhancing OpenVPX systems. Expect new designs to increasingly incorporate co-packaged optical I/O or high-density RF transitions. Designers must budget board space, connector alignment tolerances, and EMI shielding accordingly.

Security and Trust

The tri-service community has increasingly required that MIL computing systems must be cyber-hardened. There are various elements that can be incorporated in an OpenVPX/SOSA aligned computing system. This includes trusted computing modules, root-of-trust boot mechanisms, secure keylock/access, and hardware-based data isolation are a growing part of system architectures. This includes red/black separation for preventing classified data from mixing with unclassified content. As OpenVPX/SOSA evolve, perhaps elements of red/black separate thinking will be employed. For example, external access requirements such as commands through the chassis manager perhaps can be kept separate from data traffic.

Evolving Standards

While we've seen that new MOSA architectures are evolving through VITA and SOSA to meet tomorrow's advanced computing needs, 3U and 6U OpenVPX will remain critical to the backbone of critical platforms in defense, aerospace, and industrial applications for decades to come. Not all system applications require the performance of VITA 100, plus there are cost, lead-time, integration, risk mitigation, training, and many other factors that affect what architecture is chosen. In fact, there are still a few recent designs that still use 50-year-old VMEbus technology and it does what they need.

However, the road ahead demands more performance. VITA 91 provides the bridge — enabling higher data rates and denser interconnects without disrupting existing infrastructure. VITA 100 lays the groundwork for an entirely new generation of ruggedized computing platforms, purpose-built for the AI-enabled, multi-domain, data-intensive future of military and aerospace missions.

System architects and designers must think proactively — adopting flexible, standards-aligned, and future-compatible design methodologies now to ensure long-term success. Those who do will be well-positioned to deliver rugged, high-performance, and upgradeable platforms that can meet tomorrow's mission demands — no matter how complex or connected the battlefield becomes.

This article was written by Justin Moll, Vice President of Sales & Marketing, Pixus Technologies (Waterloo, Canada). **For more information, visit www.pixustechnologies.com.**

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Selecting the Best Plastic for Spacecraft Applications

Plastic materials are used for a wide variety of spacecraft applications including seals, bearings, fasteners, electrical insulators, thermal isolators, and radomes. Selecting plastics for use in space is complex due to wide operating temperature ranges, vacuum conditions, and exposure to radiation and atomic oxygen. Additionally, some spacecraft applications require sealing flammable propellants such as hydrogen and oxygen. This article will present some design considerations when selecting plastics for use in spacecraft. It will provide rich data on the performance characteristics of plastics as well as examples of successful spacecraft applications.

Operating Temperature Range

The operating temperature range for a plastic spacecraft component may extend from low temperatures, for applications such as seals for cryogenic propellants, to high temperatures for assemblies where parts are exposed to heat from the engines. Unfortunately, material properties sheets for most plastics don't provide rich information on their performance at extreme temperatures.

For spacecraft assemblies that involve cryogenic conditions, it is important that the plastic maintain moderate compressive modulus and some level of ductility. This is especially true for components such as seals and bearings where the plastic part needs to be soft enough to conform to imperfect mating metal surfaces. Although many plastics become brittle at cryogenic temperatures, a few materials such as polyimide maintain much of their room temperature ductility in extremely cold conditions. For example, Figure 1 shows compressive testing results for unfilled polyimide at room temperature and at 77 Kelvin. In this example, polyimide maintains sufficient ductility to be useful for a number of spacecraft applications.

Background Image: Gorodenkoff/Adobe Stock

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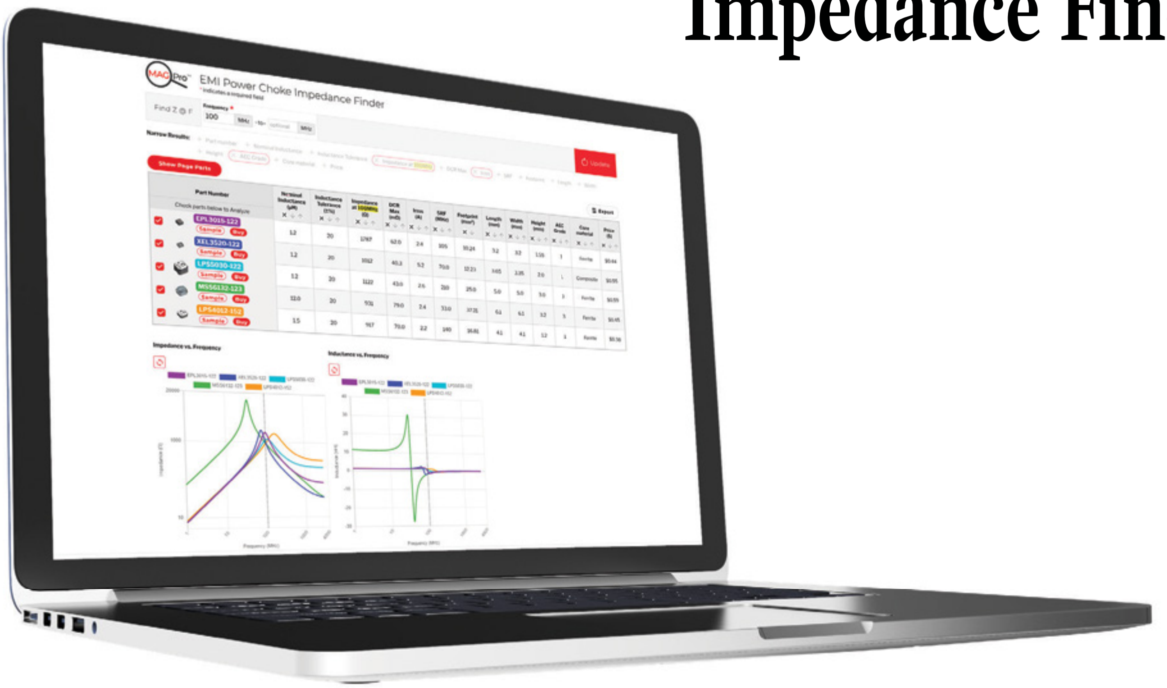

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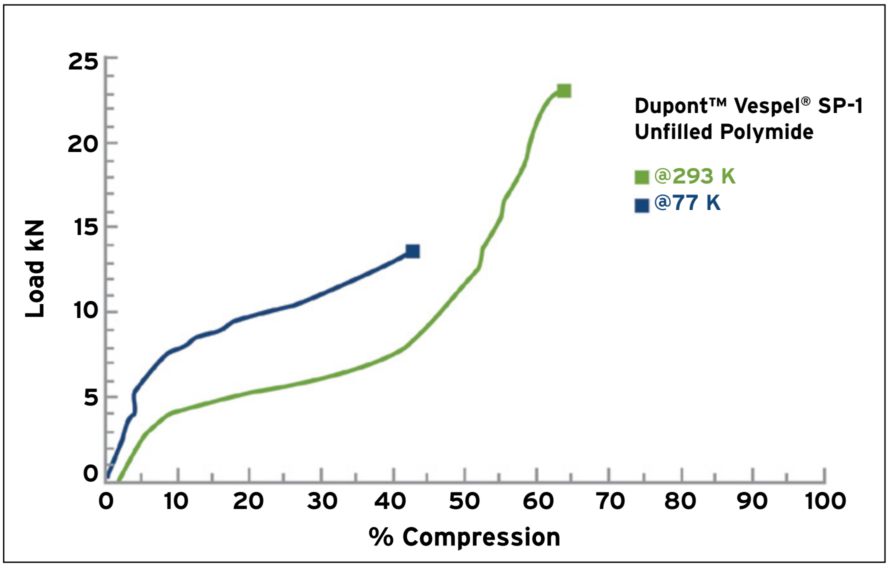
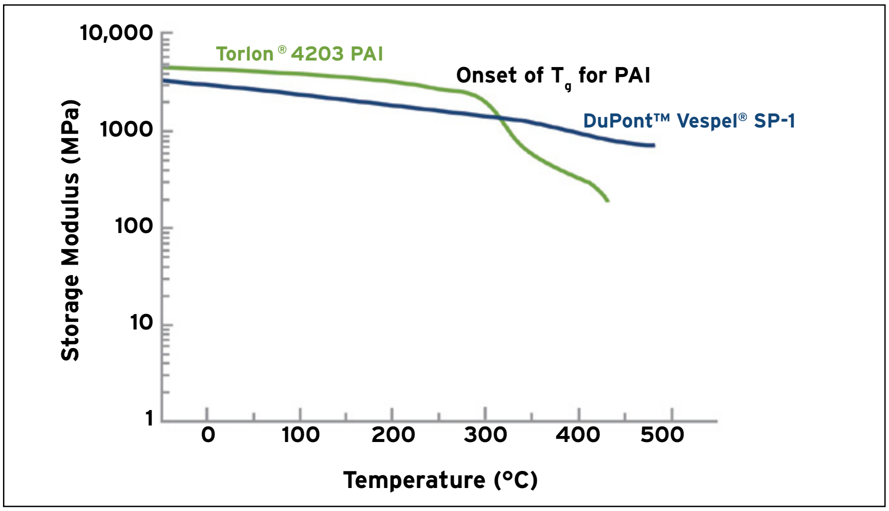


Applied Compressive Load vs. Compression for Polyimide at 77 K and 293 K. (Image: Adapted from McDonald & Rao, 1987)



Storage Moduli of Polyimide and Polyamide-imide as a Function of Temperature. (Image: Adapted from Kane & Bloom, 2004)

There is some complexity involved when selecting plastic materials for elevated temperature service. Mechanical properties, thermal expansion rates, creep and stress relaxation behavior, and embrittlement over time due to degradation are all important considerations.

Dynamic mechanical analysis provides important information about the load bearing properties of plastics at elevated temperatures. For example, the DMA curves shown in Figure 2 compares two polymers which are often used for aerospace applications. The DMA curves illustrate that PAI (polyamide-imide) is stiffer than PI (polyimide) between 0 °C and PAI's glass transition temperature of 275 °C, making PAI a good candidate for certain applications within this temperature range. However, above PAI's Tg, the plastic rapidly loses its load bearing properties.

In contrast, PI maintains load bearing properties at temperatures up to 450 °C (at least for short periods of time), which is why polyimide is often selected for elevated temperature applications on spacecraft. For example, NASA qualified polyimide for use as locking elements for fasteners on the solid rocket boosters for the space shuttle at service temperatures up to 232 °C. NASA also qualified polyimide with PTFE and graphite fillers for use on the oxidizer turbine bypass valve on the Ares J-2X upper stage engine at temperatures up to 399 °C.

Oxygen Compatibility

Spacecraft systems that control the flow of oxygen require special care since plastics are a potential source of ignition in oxygen systems. When selecting plastics for oxygen service, it is important to evaluate multiple dimensions of flammability including pressure and temperature limitations, autoignition temperatures, and sensitivity to ignition from impact (Bozet, et al., 2011, Foresyth, et al., 2000, Schoenman, 1989).

15 percent graphite filled polyimide, PTFE, and PCTFE are the plastic materials most often used for oxygen service within certain specified design boundaries. PCTFE is sensitive to molding process effects, which can result in variability of the material's crystallinity and molecular weight. Under certain circumstances, this variability can negatively impact PCTFE's ability to be safely used in oxygen systems. Detailed specifications, rigorous material certifications, and lot testing are important when specifying plastic materials for use in oxygen service.

Vacuum Conditions

Vacuum conditions present a challenge for spacecraft design, particularly when plastic components will be in sliding contact with mating metal surfaces. Molybdenum disulfide can be an effective additive to reduce friction and extend the wear life of plastics that are used for applications such as bearings and bushings in vacuum service. For example, Figure 3 shows the low coefficient of friction and the low wear rate of molybdenum disulfide-filled polyimide compared with unfilled and graphite filled polyimide. NASA specified 15 percent molybdenum disulfide-filled polyimide for the bearing surfaces of the rotating joints on the lightweight survivable Mars rover. This reduced the mass of the assembly by 10 percent compared with traditional ball bearing designs.

Vacuum conditions require plastics with low outgassing, measured as TML (total mass loss), CVCM (collected volatile condensable material), and WVR (water vapor regained). NASA defines "low outgassing" materials as having a TML of 1 percent or less and a CVCM of 0.10 percent or less (Campbell & Scialdone, 1993). NASA's Outgassing Database, which can be accessed online, provides TML, CVCM, and WVR values for a wide range of plastic materials.

Radiation Exposure

Plastics used for space applications may be exposed to radiation from the space environment (cosmic rays, solar electromagnetic radiation, etc.) as well as sources internal to the spacecraft including neutrons and gamma rays from onboard nuclear reactors. Designing for robustness to radiation will become increasingly important as satellites move from traditional chemical propulsion systems to nuclear propulsion. At certain radiation doses, polymers lose strength and ductility (tensile elongation). This can potentially affect plastic part performance, especially in applications that require long-term exposure to radiation. Certain plastics including polyimide, polyetherimide, polybenzimidazole, and PEEK have superior resistance to radiation compared with other engineering polymers. These materials are often specified for spacecraft applications that involve radiation exposure.

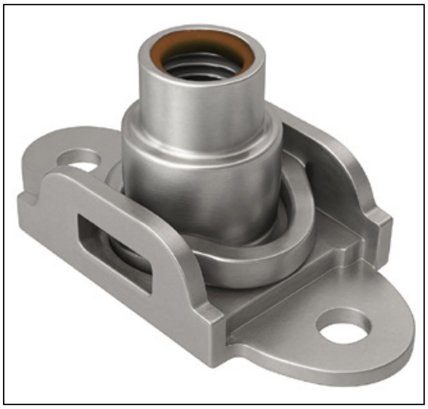
Plastic components on spacecraft in low earth orbit will erode due to exposure to atomic oxygen. NASA's polymer erosion and contamination experiment measured atomic oxygen erosion yields for 38 polymers placed in LEO for nearly 4 years as part of the MISSE 2 materials International Space Station experiment (Banks et al., 2009). Several fluoropolymers including FEP, PFA, and PTFE exhibited low erosion yields from atomic oxygen exposure.

Some spacecraft designs include RF-transparent plastic radomes to protect communication antennas. This requires plastics with low dielectric constants and low loss factors for the frequencies of operation that are also robust to the spacecraft environment. For example, NASA used unfilled polyimide for the radome for the Mars Exploration Rover descent UHF antenna.

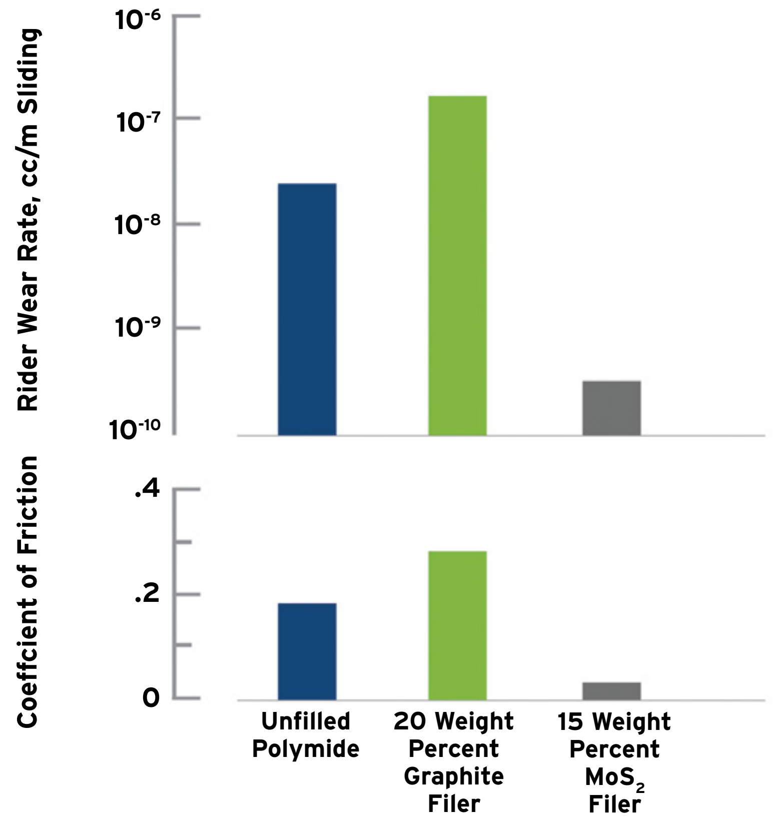
The purpose of this article has been to present some design considerations when selecting plastics for use in spacecraft. Readers who wish to explore this topic in greater depth are encouraged to review the articles listed in the references section. Curbell Plastics website also has technical data on the plastics used in spacecraft as well as a recorded webinar on selecting plastics for spacecraft applications.

References

1. Banks, B., Backus, J., Manno, M. Waters, D., Cameron K. & Groh, K. (2009). Atomic Oxygen Erosion Yield Prediction for Spacecraft Polymers in Low Earth Orbit. NASA Technical Memorandum TM-2009-215812.
2. Bozet J., Heyen, G., Dodet, C., Duquenne, M., & Kreit, P. (2011). Liquid oxygen compatibility of materials for space propulsion needs. Pre-



Artist's representation of a Threaded Nut With a Vespel® SP-1 Polyimide Locking Element. Similar to the one used on the Space Shuttle Solid Rocket Booster. (Image: Adapted from Wood, C., 1984)



The chart shows the coefficient of friction and wear rate for various polyimide formulations. Test conditions: Sliding on 440-C stainless steel in vacuum (10-10 mm Hg). Sliding velocity of 197 centimeters per second with a 1,000 gram load for 1 hour. (Image: Adapted from Buckley, 1966)

sented at the 4th European Conference for Aerospace Sciences (EUCASS).

3. Buckley, D. H. (1966). Friction and Wear Characteristics of Polyimide and Filled Polyimide Compositions in Vacuum (10-10 mm Hg). NASA Technical Note TN D-3261. NASA Lewis Research Center, Cleveland, OH.
4. Campbell, W. & Scialdone, J. (1993). Outgassing Data for Selecting Spacecraft Materials. NASA Reference Publication 1124, Revision 3.
5. Forsyth, E. T., Gallus, T. D., and Stoltzfus, J. M. (2000). Ignition Resistance of Polymeric Materials to Particle Impact in High-Pressure Oxygen. In Flammability and Sensitivity of Materials in Oxygen-Enriched Atmospheres: Ninth Volume, ASTM STP 1395, T. A. Steinberg, B. E. Newton, and H. D. Beeson, Eds., American Society for Testing and Materials, West Conshohocken, PA.
6. Kane, P. & Bloom, J. (2004). Dimensional Stability and High Frequency Properties of Polymeric Materials for Machined Test Sockets. 2004 BiTS Burn in & Test Socket Workshop.
7. McDonald, P. & Rao, M. (1987). Thermal and Mechanical Properties of Vespel® at Low Temperatures. Proceedings from the International Cryogenic Materials Conference, Saint Charles, IL, 14-18 June, 1987.
8. Schoenman, L. (1989). Orbit Transfer Rocket Engine Technology Program. Contract NAS 3-23772, Task Order B.5. NASACR-182195. Final Report Oxygen Materials Compatibility Testing. Prepared by Aerojet Techsystems Company for NASA Lewis Research Center, Cleveland, OH.

NASA Qualified Polyimide With PTFE and Graphite Fillers for Use on the Oxidizer Turbine Bypass Valve on the Ares J-2X Upper Stage Engine. (Image: NASA Image and Video Library)

This article was written by Keith Hechtel, DBA, Vice President of Business Development & Marketing, Curbell Plastics, Inc. (Orchard Park, NY). **For more information, contact Keith Hechtel, at Khechtel@curbellplastics.com, or visit www.curbellplastics.com.**

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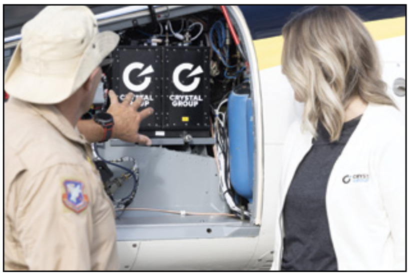

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Aerospace and Defense Winner – Keshika Warnakula

Keshika Warnakula is a Senior Flight Mechanics Engineer at Syos Aerospace Limited and the winner of the 2025 Rising Stars Award Aerospace and Defense category.

Syos Aerospace is based in Mount Maunganui, New Zealand, specializing in robotics engineering and the development of autonomous air, land, and sea vehicles. The company also has an office located in Fareham, UK, and was recently named New Zealand's "Hi-Tech Company Of the Year."

Warnakula is responsible for most of the flight calculations and design optimization for drones developed by Syos Aerospace. These responsibilities range from performing Computational Fluid Dynamics (CFD) analysis investigating stall limits and flow behavior across a blade, or solving complex set of 6 non-linear equations simultaneously in MATLAB analyzing performance and behavior of the overall air vehicle.

Additionally, she has taken on a mentoring role within the company for junior engineers, including instructing them on how to solve complex math equations in MATLAB, as well as running CFD analysis in Ansys.

Keshi, as she is known by her colleagues, is also a volunteer in the Wonder Project, which is a free program for schools that inspires young students to pursue careers in science, technology, engineering and math (STEM). The Wonder Project is managed by Engineering New Zealand, a nonprofit with 22,000 members that helps future engineers find careers.

As a member of the Wonder Project, Warnakula travels to schools throughout New Zealand. Not only does she volunteer her time, but she has also attracted other colleagues to volunteer. Based on her lead and success in recruiting volunteers to the Wonder Project, Syos now has a program that counts the first six hours of each month of any volunteering time as part of their employees' standard work week.

AEROSPACE & DEFENSE
RISING STAR
AWARDS
WINNER
2025

Keshika Warnakula

Senior Flight Mechanics Design Engineer

Syos Aerospace

MS, Aerospace Vehicle Design

Keshika Warnakula, Senior Flight Mechanics Engineer, Syos Aerospace, is the winner of the 2025 Rising Star Awards - Aerospace and Defense category.

How did you first become involved in or interested in working in the aerospace industry? When did you first start thinking about working in aerospace or what made you choose this specific industry?

My interest in aerospace started when I was really young. I remember when I was around 11 years old, my parents took me abroad for the first time for a holiday. I was completely blown away watching airplanes take off and land live at the airport.

And from that moment, I couldn't stop thinking about how these amazing, massive machines worked and the incredible engineering that made it fly. So I was curious about the whole process and the concept, and my interest in aerospace has been growing ever since. As I kept maturing in school, one of my math teachers noticed that I was doing well in mathematics, so she also encouraged me to consider a career in engineering.

So along with that encouragement, and my curiosity and love for aircraft made me realize I should do aerospace engineering when I grow up and that would be a great fit for me.

I also have to say my lovely parents and my sister have been incredibly supportive throughout my journey. They would get me books and magazines about aircraft and also DVDs about things like air shows and aviation documentaries. Reading those books and watching those DVDs from a young age further helped nurture my love for aerospace and motivated me to pursue a career in in this industry.

I feel like I'm not only lucky to fulfill my lifelong dream of becoming an aerospace engineer, but also to be able to combine my enthusiasm for aircraft with my natural analytical and technical skills.

Syos was named Hi-Tech Company of the Year at the 2025 NZ Hi-Tech Awards. (Image: Syos Aerospace)

What is the main focus of your role at Syos Aerospace and what are some of the main technologies, products or services that you primarily work on?

My role as a senior flight mechanics design engineer at Syos, is based in our research and development facility in Mount Mangani, New Zealand. Syos is a robotics company specializing in design and manufacture of utilitarian uncrewed vehicles across air, land and sea domains. We have a diverse product family including uncrewed aerial, service vehicles, and ground vehicles (UAV, USV, and UGV). Each of these vehicles has modular payloads to enhance capabilities.

I am part of the vehicle design team where I primarily focus on designing rotary-wing UAVs. My main focus is on analyzing and optimizing aircraft performance, stability and control.

Throughout various flight phases, that involves advanced simulation, running advanced simulations, flight, flight dynamics modeling and system level performance assessment. I also work closely with multiple teams to ensure our vehicles meet safety, efficiency and regulatory standards while also pushing boundaries for what's possible in uncrewed aerial systems.

What is the aerospace industry like in New Zealand? Is there a large presence of aerospace manufacturers and suppliers?

The aerospace industry here in New Zealand is growing rapidly and getting a lot of attention from the local and international aerospace community. It's a thriving sector, especially when it comes to advanced aviation and space innovation.

This beautiful country has over 5 million people population wise, and it supports around 17,000 full time jobs across the aerospace/advanced aviation sector, which is quite impressive.

Companies like Syos Aerospace, Rocket Lab, and Dawn Aerospace are playing a big role in helping kickstart a lot of growth and interest in the local as well as international aerospace scenes. We also do have a busy facility in South Island and it's actually growing really fast from a sales-perspective.

Syos was also named the New Zealand Hi-Tech Company of the Year at the 2025 NZ Hi-Tech Awards event held in May, which we are really proud of. Even though the aerospace industry here is smaller than other countries, we're definitely punching above our weight when it comes to innovation and advanced technology in aerospace. I'm really excited to be part of that growth.

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A drone developed by Syos Aerospace on display at DSEI 2025. (Image: Syos Aerospace)

Based on your experience over your career, do you still see aerospace as a male-dominated industry? Is that changing?

I think it's traditionally been a male dominated industry, but that's definitely changing and I'm excited to be part of it. Actually, I've seen a lot of women, more and more women stepping into all kinds of role, especially on the engineering and design side of aerospace, and also in leadership roles on the innovation side as well.

If I talk about our company at size, we are actually proud to be part of the Women in Defense Charter and contributing towards improving gender balance and supporting women in the industry.

Personally, I also spend time volunteering with young kids, especially girls, to help spark their interest in engineering and aerospace. I think it's important for kids to see people in the industry to get inspired and make it feel like it's possible. So sharing my story and what I do, it's all about showing them aerospace is an industry they can consider.

I feel like the presence of women in aerospace is growing and I feel like it's headed toward a positive gender-balanced direction.

Are there any new or emerging aerospace or defense technologies that you have a particular interest in? How do you see that technology evolving in the future?

I'm really interested in the emerging technologies, especially drone technology and how it's growing in both commercial and defense sectors. At Syos, we are seeing how new advancements from better structural design to autonomy and use of artificial intelligence (AI) are really pushing the limits of what drones can do. They're no longer just tools for collecting data. They're also becoming fully integrated platforms.

For things like logistics, surveillance and environmental monitoring, what excites me the most is moving from manually operated drones to fully autonomous systems that can make real-time decisions using onboard AI and machine learning.

That shifts open up a huge potential, especially for beyond visual line of sight operations, which I think is a major growth area, particularly in the areas like infrastructure inspection, search and rescue and precision agriculture.

So looking ahead, I really believe drone technology will become a core part of both civil and commercial aerospace, especially with new UAV traffic management systems being developed and regulatory support expanding.

This article was written by Woodrow Bellamy III, Senior Editor, SAE Media Group (New York, NY).

Background Image: Carbice

Managing Thermal Reliability at the Edge: The Critical Challenge DoD Isn't Talking About

When a Marine in the field launches an uncrewed aerial vehicle (UAV) to gather intelligence, it becomes more than just a drone. It's a flying data center that processes AI workloads, runs machine learning algorithms, and transmits critical information through a complex network designed to provide situational awareness across multiple commands. All of this computational power generates significant heat, and in the confined space of a UAV operating in harsh environmental conditions, thermal management becomes critical to mission success. But there's a fundamental question the U.S. defense isn't asking: how will we manage the heat?

The Golden Dome, the Trump administration's vision for missile defense, builds upon the existing Joint All-Domain Command and Control (JADC2) framework for connecting sensors from all branches of the U.S. armed forces into a unified network powered by artificial intelligence. This plan faces an existential threat from thermal management challenges that have plagued edge computing systems for years.

AI Makes Everything Hotter

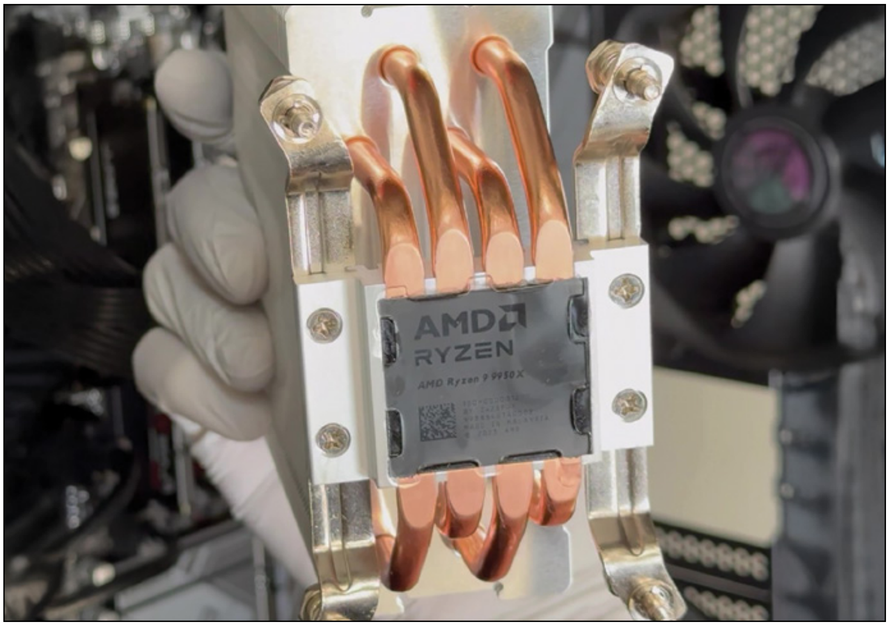
The introduction of artificial intelligence and machine learning at the edge has fundamentally changed the thermal equation. Each time a drone gathers information, AI infrastructure processes that data faster than ever before, generating exponentially more heat in the process. Unlike traditional data centers, where convection cooling is facilitated by increased energy demand, edge systems won't have

The image shows an area of the laboratory that Carbice uses to test and simulate the heating challenges that can be encountered by electronics and subsystems when deployed on military vehicles and platforms for combat and other missions. (Image: Carbice) the same luxury of infinite energy to cool those operating at the edge. They must dissipate heat while operating in deserts, arctic conditions, and even in the vacuum of space.

Space-based systems face particularly unique challenges. Satellites must employ very specific thermal system management techniques to thermally balance the spacecraft to maintain peak performance for its mission life. The space sector recognized this thermal challenge early, resulting in advanced thermal management becoming a go-to-market priority for companies.

JADC2: A Golden Opportunity for Systems Engineering

While the Trump administration's Golden Dome builds on JADC2, it will have the same challenge of mitigating heat generated by edge sensors. The question is whether field-deployed sys-



A prototype military vehicle edge computing device is shown here, designed with a heat sink for optimal thermal management. (Image: Carbice)

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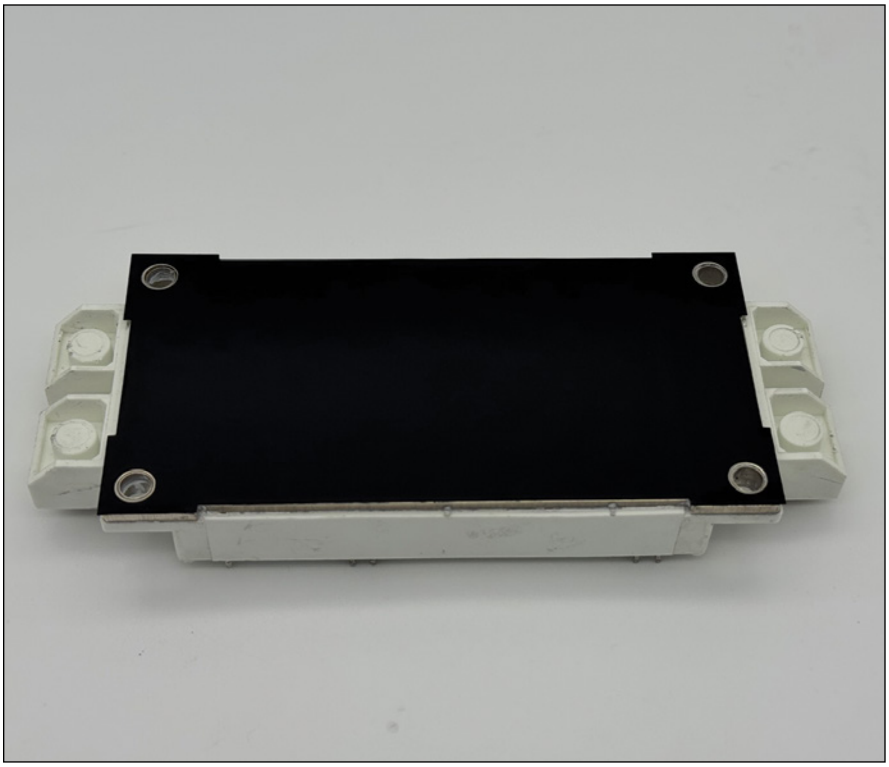
A prototype air cooled CPU developed by Carbice for military edge computing applications. (Image: Carbice)



A prototype power module developed by Carbice. Every device or technology features Carbice's unique approach to thermal management. (Image: Carbice)

tems will work when they are needed most; how will maximizing hardware reliability over time through thermal management become the centerpiece of the system design approach? As systems are designed to move data through satellites and connect sensors across multiple domains, predictable thermal interface performance must be seen as a foundational requirement, not an afterthought. Our national defense and warfighters must be equipped with reliable and efficient systems, rather than ones that fail when needed most or offer limited operational capabilities in the field, especially when missions require extended hours.

The DoD's Thermal Blind Spot

The defense community has taken a surprisingly naive approach to thermal management, treating heat as a secondary concern rather than a primary design constraint. While the 2024 National Defense Authorization Act recognized the strategic importance of advanced thermal interface materials, specifically calling out foreign competition in aligned carbon nanotube technology, procurement practices still default to legacy solutions that degrade under operational stress.

The result? Mission-critical radios and edge sensors will fail prematurely, often before their operational lifespan has ended, leaving warfighters turning to use their personal cell phones to communicate with command or to have an incomplete data set in mission-critical environments.

The 23-Minute Reality Check

Consider this real-world scenario: A warfighter carries a backpack designed as a "mini data center" containing battlefield sensors and/or communications equipment. Consider, every piece of the system generates heat as it processes and transmits mission-critical data. This equipment requires the same thermal management effectiveness as traditional data centers, but lacks the luxury of climate control or redundant cooling systems. If this system overheats or begins to become unreliable, the intelligence being gathered becomes questionable at best.

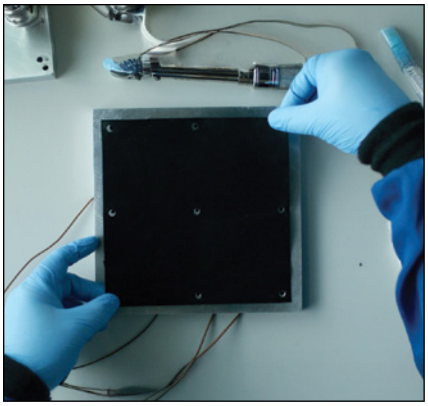
For example, a drone manufacturer supplying the U.S. Army discovered its systems could only operate for 23 minutes before overheating and forcing a shutdown. Due to the limited flight time, soldiers' intelligence gathering is restricted to 23 minutes, which could become the difference between mission success and catastrophic failure. This scenario can be mitigated if system architects "require" thermal interface systems management to be predictable.

The Path Forward

The long-term operational and cost risks of ignoring thermal management are substantial. Billions of dollars invested in modernization will be worthless if the underlying hardware can't maintain performance under thermal stress. The Pentagon's $175 billion vision for next-generation command and control hinges on solving this challenge.

By utilizing thermal interface materials that exhibit predictable performance over the system's mission life, the operational lifespan and peak performance of equipment can be dramatically extended and maintained across extreme environments. But integration must happen at the requirements phase of the design, not as a field retrofit. Thermal management must become a predictable, scalable design input, just like processing power or battery capacity.

As the Golden Dome moves from concept to deployment, the system architects have a choice: continue treating thermal interface management as a secondary concern, or recognize it as the critical enabler of reliable edge computing that modern warfare demands. Warfighters can't wait for systems to cool down.



A large interface "pad" developed by Carbice to provide optimal air flow and cooling for edge devices and systems. (Image: Carbice)

This article was written by Rafael Spears, GM of Global Strategy, Carbice (Atlanta, GA). **For more information, visit www.carbice.com.**

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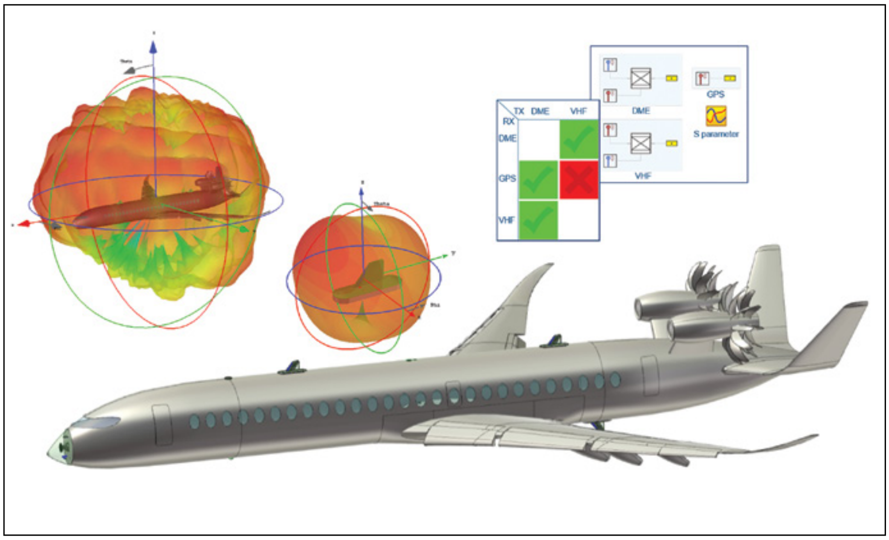
Analyzing Aircraft Antenna Placement and Performance with Unified Modeling and Simulation

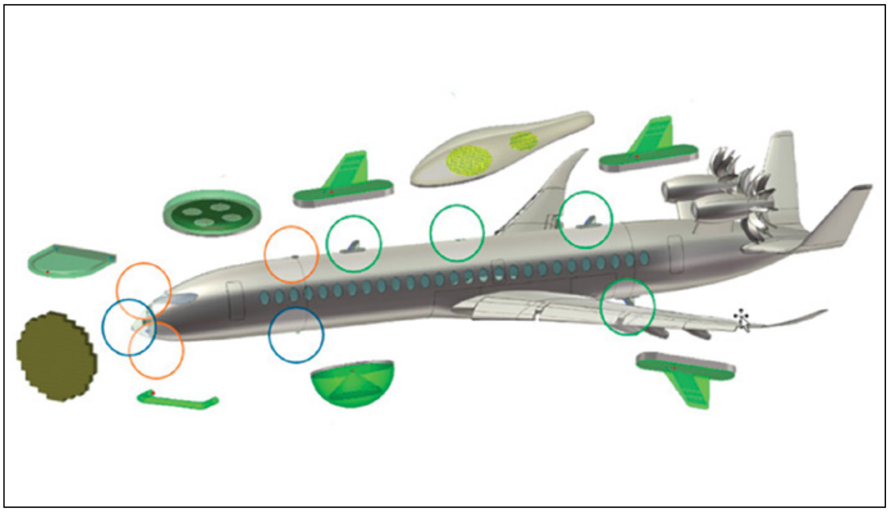
Reliable antenna performance is crucial for aircraft communication, navigation, and radar detection systems. However, an aircraft's structure can detune the antenna input impedance and obstruct radiation, creating a range of potential problems from a low-quality experience for passengers who increasingly expect connectivity while in the air, to violating legal requirements around strict compliance standards. Determining appropriate antenna placement during the design phase can reduce risk of costly problems arising during physical testing stages.

Engineers traditionally use a variety of CAD and electromagnetic simulation tools to design and analyze antennas. The use of multiple software tools, combined with globally distributed aircraft development teams, can result in challenges related to sharing models, transferring data, and maintaining the associativity of design and simulation results. To address these challenges, aircraft OEMs and suppliers are implementing unified modeling and simulation technology and processes, which enables them to combine their CAD model with multiphysics simulation within a secure, data-managed and collaborative computing environment. By using a common user interface with unified collaboration, data management, and design and simulation tools, development teams can create a virtual twin of the complete system, including the aircraft structure, electronics and antennas.

Accurate simulation of installed antenna performance requires solving detail-rich problems of high contrast scales, and wide RF bandwidth. Aircraft antennas typically operate from several hundred Megahertz up to 10s of GHz; the maximum electrical scale of an aircraft can then be 100s or even 1,000s of wavelengths in total size, whereas electrically critical features like seams and windows will be only a fraction of a wavelength. Therefore, flexible and hybridized simulation methods are highly desirable.



The image shows how SIMULIA can be leveraged to simulate the performance of a newly designed aircraft antenna. (Image: Dassault Systemes)



An image showing how SIMULIA provides a virtual twin of individual aircraft antenna components and their positioning attached to an airframe. (Image: Dassault Systemes)

To facilitate collaborative design and placement of the antennas, development teams need access to the aircraft design model, including the structural elements, electronic system elements, as well as the antenna and radio specification. The development team then selects the type of antenna design and antenna feed network best suited to meet requirements.

Unified modeling simulation technology and methods simplify the process of defeaturing the parameterized CAD model and assigning material properties, needed for simulation. Once an antenna design is created and placed within the aircraft design, the team can use multiscale electromagnetic simulation capabilities to analyze a range of performance factors across wide frequency ranges, such as signal propagation pattern, filter designs, high-power breakdown, and others.

This rapid simulation of the antenna performance within the aircraft model, enables early identification of possible co-site interference problems and provides the opportunity to modify the antenna design and placement before committing to costly physical prototypes.

Some benefits of a truly unified design and simulation environment for aircraft design and antenna placement can include:

- **Aircraft modeling:** De-featuring 3D CAD models for simulation can be time-consuming and create a bottleneck. With the unified modeling and simulation, development teams can generate a simplified 3D model for simulation while maintaining associativity with the detailed CAD model, without compromising accuracy.
- **Antenna synthesis:** Engineers can select antenna models from a library of different types available across their organization or supply chain, tagged according to their performance specifications, and apply design exploration techniques to quickly find an antenna to meet their requirements.
- **Antenna placement:** Using the combined aircraft and antenna models, electromagnetics simulation capabilities are used to analyze installed antenna performance and coupling. Design teams can quickly update and analyze a variety of antennas to select the best design for the performance criteria.
- **Co-site-interference:** Electromagnetic simulation also enables design teams to analyze potential interferences of aircraft systems connected to antennas, using tools like the Antenna Placement app in the 3DXPERIENCE platform. Filter synthesis and simulation tools allow the design of filter solutions to mitigate interference.
- **Multiphysics / Multiscale simulation:** Since exterior antenna placement can affect airflow around the aircraft, unified modeling and simulation enable design teams to perform both electromagnetic and aerodynamic simulations on a shared model. This allows rapid trade-offs between aerodynamic and electromagnetic performance to find a solution to meet all the functional requirements.

Validated Antenna Performance - Virtually

Ultimately, the virtual twin of the aircraft and antennas, created on a common computing platform, provides a consistent reference model for all teams, from requirements to validated design, regardless of their location. By leveraging unified modeling and simulation to perform virtual tests in a realistic operating environment, aircraft manufacturers are able to evaluate the installed performance of more antenna options faster and at lower cost than physical testing alone. Additionally, visualization of electromagnetic fields and currents enables engineers to see and correct potential problems during the design process, reducing the risk of costly late-stage failure.

This article was written by Ian Wood, SIMULIA Aerospace & Defense, Sr. Industry Process Expert, Dassault Systemes (Vélizy-Villacoublay, France). **For more information, visit www.3ds.com.**

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U.S. Army Tests Innovative Autonomous Tactical Vehicle Prototype

U.S. Army soldiers recently evaluated the off-road delivery capabilities of Overland AI's "ULTRA" autonomous vehicle during a demonstration exercise in Vaziani, Georgia.

U.S. Army, Vaziani, Georgia

In an effort to cut costs and improve supply delivery efficiency, the U.S. Army assessed the Overland AI ULTRA Fully Autonomous Tactical Vehicle prototype during exercise Agile Spirit 25 at the Combat Training Center, Vaziani Training Area, Georgia, in July.

"Agile Spirit 25 is the 12th iteration of a biennial multinational exercise designed to enhance readiness, interoperability and combined operational capabilities, which promotes our countries' shared goal of security and stability in the Black Sea Region," said Col. Will Cox, Co-exercise Director for Agile Spirit 25.

Cox clarified that U.S. Army Europe and Africa set a key objective to work on innovation and experimentation, improving processes and overall safety on the battlefield. The U.S. Army has evaluated multiple autonomous vehicle providers for potential contracts to integrate cutting-edge technologies to advance military capabilities. For Agile Spirit 25, the U.S. Army put a fully autonomous vehicle with artificial intelligence (AI) to the test.

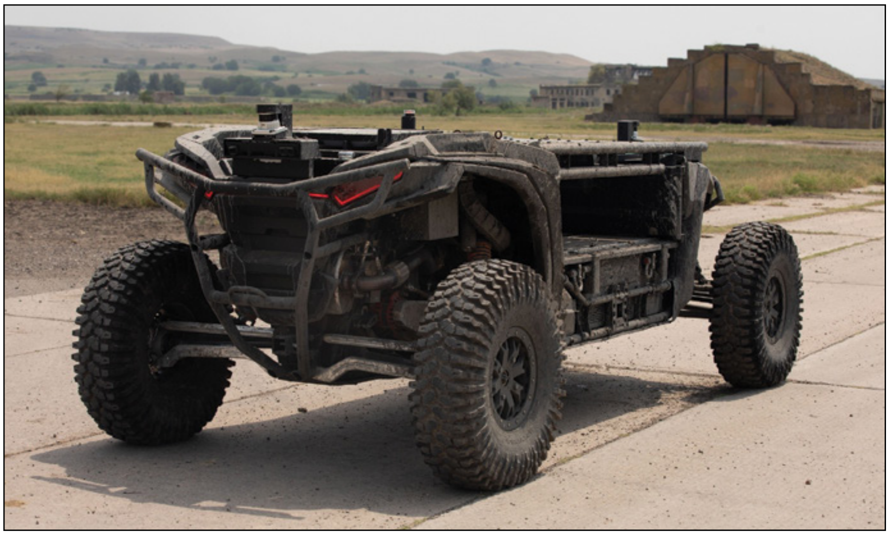
"We're trying to keep soldiers off the front lines and keep our warfighters safe," said Adam Ungar, Senior Program Manager at Overland AI.

As Ungar explained, an autonomous vehicle can be deployed in harm's way instead of service members to save lives. The value of autonomous vehicles is immeasurable as their use could directly prevent casualties.

"Uncrewed systems are radically changing the character of war," said Byron Boots, Co-founder and CEO at Overland AI. "We are developing autonomous ground vehicles like ULTRA to provide safety by taking the warfighter out of harm's way."

Overland AI personnel sought to understand U.S. Army soldiers' needs on the battlefield during Agile Spirit 25, running resupply tests for 60mm and 120mm mortar units. The U.S. Army Soldiers with 1st Squadron, 91st Cavalry Regiment, 173rd Airborne Brigade had practiced with the system months before Agile Spirit 25 and quickly adapted to the system's controls and functions.

"I actually did some training on it [the ULTRA] back in Germany about two months ago," said Pfc. Jonathan Brooks, a mortarman with 1st Squadron, 91st Cavalry Regiment, 173rd Airborne Brigade.



Seattle-based tech company, Overland AI, demonstrates their fully autonomous tactical vehicle "ULTRA" at Vaziani Training Area with U.S. Army Soldiers from 1st Squadron, 91st Cavalry Regiment, 173rd Airborne Brigade, during exercise Agile Spirit 25. Agile Spirit 25 underscores the U.S. commitment to security and stability in the Black Sea region and highlights the importance of strong alliances and partnerships in addressing shared security challenges. (Image: U.S. Army photo by Sgt. Alex Lopez)

Overland AI's ULTRA, pictured here during its off-road evaluation in Vaziani, Georgia, is an all-wheel, off-road drive vehicle with a maximum speed of 35 miles per hour. It can deliver up to 1,000 pounds with a cruising range of 100 miles at 20 miles per hour (terrain dependent) (Image: U.S. Army photo by Sgt. Alex Lopez)

Brooks shared that he initially had mixed feelings about the ULTRA. He found the concept fascinating yet was apprehensive about the details of AI integration. Seeing it in action, he was amazed by its capabilities and saw that the AI was an assisting tool, not an uncontrollable entity. Its cameras and sensors are advanced, detecting changes in terrain and altering its course to find a clear path.

"ULTRA was built to be modular and mission-adaptable from the start," said Chris Merz, Director of Product, Overland AI. "We are actively developing variants that support casualty evacuation, counter-unmanned aircraft systems, and terrain shaping operations."

Merz explained that in August 2025, Overland AI personnel will demonstrate a C-UAS and intelligence, surveillance and reconnaissance-enabled ULTRA for the undersecretary of defense for research and engineering, as well as the Army and United States Special Operations Command.

Jonathan Fauth, Lead Exercise Planner for EUCOM-directed exercise Agile Spirit 2025, explained that all objectives in U.S. Army Europe and Africa exercises are to better understand how technology can be used in a practical scenario on realistic battlefields.

"Exercises are the way we practice and test those capabilities," said Fauth. "We break something, we fix it, then we come back and do it again."

Military teams have complete oversight of the ULTRA as long as it has connectivity and a re-transmitting signal via the internet and/or satellites. Teams can also pre-program commands for the ULTRA, including traveling in certain patterns or to precise locations.

U.S. Army Soldiers with 1st Squadron, 91st Cavalry Regiment, 173rd Airborne Brigade, learn about the Overland AI ULTRA Fully Autonomous Vehicle during Agile Spirit 2025, at the Combat Training Center, Vaziani Training Area, Georgia. (Image: U.S. Army photo by Sgt. Thomas Norris)

"I would love to see more of it [the ULTRA] in the future," said Spc. Jack Padberg, a mortarman with 1st Squadron, 91st Cavalry Regiment, 173rd Airborne Brigade. "I think it can help us, as mortars, a lot."

The ULTRA is an all-wheel, off-road drive vehicle with a maximum speed of 35 miles per hour. It can deliver up to 1,000 pounds with a cruising range of 100 miles

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U.S. Army Soldiers with 1st Squadron, 91st Cavalry Regiment, 173rd Airborne Brigade, discuss the implications of the Overland ULTRA Fully Autonomous Vehicle during Agile Spirit 2025 at the Combat Training Center, Vaziani Training Area, Georgia. (Image: U.S. Army photo by Sgt. Thomas Norris)

at 20 miles per hour (terrain dependent).

"ULTRA is designed to be attritable and costs more than an order of magnitude less than a traditional crewed combat vehicle," said Boots. "Removing the need to protect a human operator allows for lighter, more affordable systems that can be deployed at scale. This represents both a financial shift and a moral one that enables commanders to deliver effects without putting Soldiers at unnecessary risk."

Ungar stated that, beyond delivering any weapons payload for the U.S. military and mounting surveillance/reconnaissance systems, Overland AI's ambition for the ULTRA is to practice medical evacuation and breaching capabilities.

"Breaching complex obstacles is among the most dangerous tasks for any unit," said Chris Higgins, Director of Business Development at Overland AI. "We have been working closely alongside multiple engineer brigades to develop uncrewed solutions that leverage autonomy for breaching operations. These systems are being developed in partnership with the Army to ensure that robots, not humans, are first through the breach."

This article was written by Sgt. Ehron Ostendorf, U.S. Army, for Joint Base San Antonio, it has been edited. For more information, visit www.jbsa.mil.

Researchers Discover New Materials That Could Enhance Fighter Jet Efficiency

New research studying shape memory alloys with AI may allow fighter jets to transform into the future with the help of new materials.

Texas A&M University, College Station, TX

In aerospace applications, high-temperature shape memory alloys (HTSMAs) — materials capable of remembering and returning to their original shapes after heating — are often constrained by high costs since they rely on expensive elements to function at elevated temperatures.

Fighter jets like the F/A-18 need to fold their wings to fit on crowded aircraft carriers. The system that folds the wings relies on heavy mechanical parts. But with new lighter, smarter alloys, those movements could be done with less weight and more efficiency. That means more jets can be ready to fly, faster and with less energy wasted.

The researchers have published their findings in the journal *Acta Materialia*. The research showcases how artificial intelligence (AI) and high-throughput

The F/A-18 aircraft pictured here could benefit from the application of novel high-temperature shape memory alloys in the design of its wing section. This technology could enable the wings to be folded using electrical heating and cooling, allowing for efficient movement up and down. (Image: Getty Images) experimentation can be combined to accelerate materials discovery and reduce development costs.

This pioneering study sets the stage for a new era in functional alloy design — faster, cheaper, and smarter. That means everything that can use this process could soon be made with materials that are not only more efficient but also more affordable for those seeking to save on costs.

This work shows that we can design better high-temperature alloys not through expensive trial-and-error but through smart, targeted exploration driven by data and physics.

The team is being led by Department Head and Chevron Professor Dr. Ibrahim Karaman and Chevron Professor II Dr. Raymundo Arroyave, who have developed a data-driven approach to material discovery.

“This work shows that we can design better high-temperature alloys not through expensive trial-and-error but through smart, targeted exploration driven by data and physics,” said Karman.

“This project is exciting as it shows the power of the advanced alloy development frameworks we have been developing in the past years.” Arroyave added.

Background

Designing new metals usually takes a lot of time and money. Scientists must test thousands of metal mixtures to find the right one — and even tiny changes, like adding just 0.1 percent more of one element, can totally change how the material behaves. With so many options, finding the correct combination for the alloy would be like guessing the right lottery numbers.

To speed things up, researchers at Texas A&M University are using powerful computers and artificial intelligence. These tools help them predict how different metal mixtures would interact, so they don’t have to test every single option in their labs. Instead, they utilize AI to help them concentrate their efforts on the more promising ones.

“With advanced computational tools, we’re not just speeding up alloy discovery — we’re reshaping how discovery happens,” said Sina Hossein Zadeh, a Ph.D. student in the Department of Materials Science and Engineering.

Research Innovation

The standout feature of this project is its integration of machine learning and experimental work through a framework known as Batch Bayesian Optimization (BBO). BBO allows scientists to iteratively refine their alloy predictions based on past experimental results, minimizing waste and maximizing discovery efficiency.

“This framework not only speeds up discovery,” Karaman said, “but also opens the door to tailoring alloys for specific functions, such as reducing energy loss or improving actuation performance in many applications.”

The goal is to make materials that move or change shape in response to something like heat or electricity — kind of like muscles for machines. These special materials are called actuators, and they’re often used in aerospace, robotics, and even medical devices.

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Challenges and the Future

Currently, the model explores alloying with copper and hafnium to enhance shape memory behavior and raise transformation temperatures. However, further research is needed to incorporate more elements and predict additional performance metrics, such as transformation strain — how much the alloy can actually move or change shape during operation.

According to Broucek, "The next frontier is to design alloys that not only transform at the right temperatures but also deliver meaningful strain in service. That's what will make them viable for aerospace and energy applications."

This article was written by Leon Contreras for Texas A&M University. For more information, contact engineeringnews@tamu.edu.

Could Metasurfaces Be The Next Quantum Information Processors?

Researchers blend theoretical insight and precision experiments to entangle photons on an ultra-thin chip.

Harvard University, Allston, MA

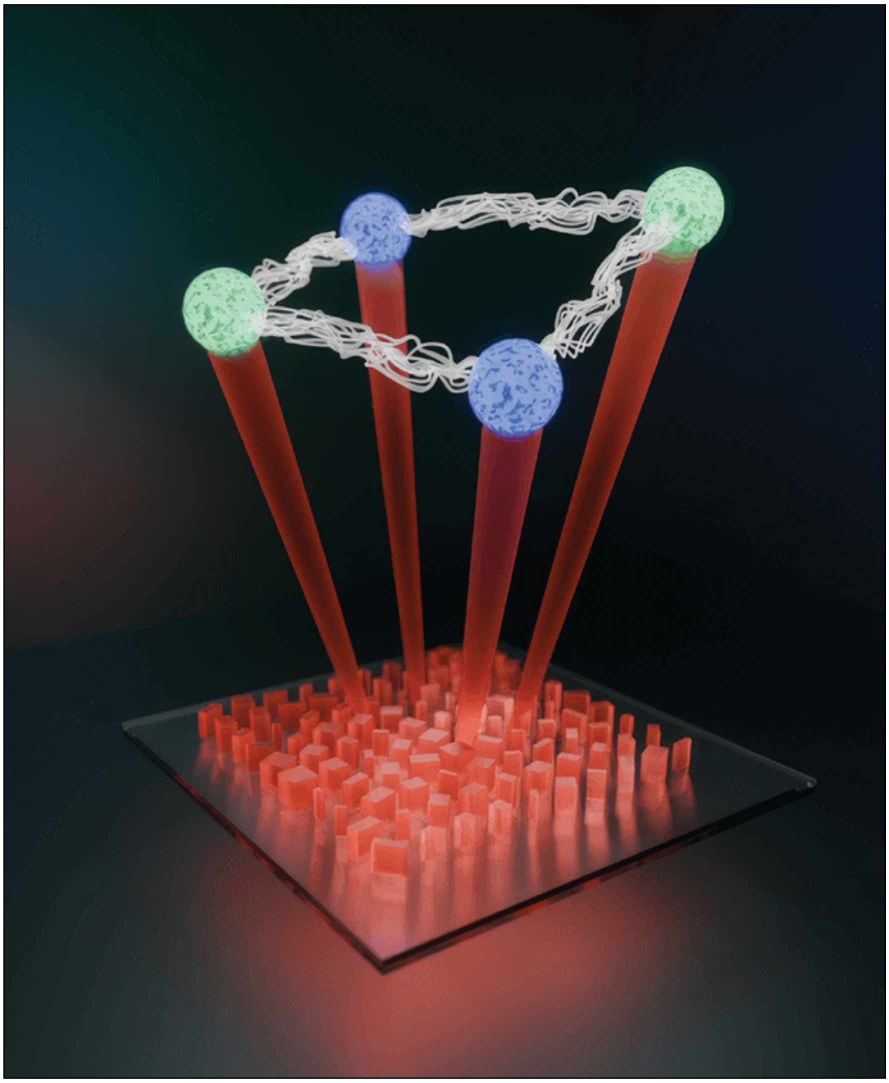
In the race toward practical quantum computers and networks, photons — fundamental particles of light — hold intriguing possibilities as fast carriers of information at room temperature. Photons are typically controlled and coaxed into quantum states via waveguides on extended microchips, or through bulky devices built from lenses, mirrors, and beam splitters. The photons become entangled – enabling them to encode and process quantum information in parallel – through complex networks of these optical components. But such systems are notoriously difficult to scale up due to the large numbers and imperfections of parts required to do any meaningful computation or networking.

Could all those optical components could be collapsed into a single, flat, ultra-thin array of subwavelength elements that control light in the exact same way, but with far fewer fabricated parts?

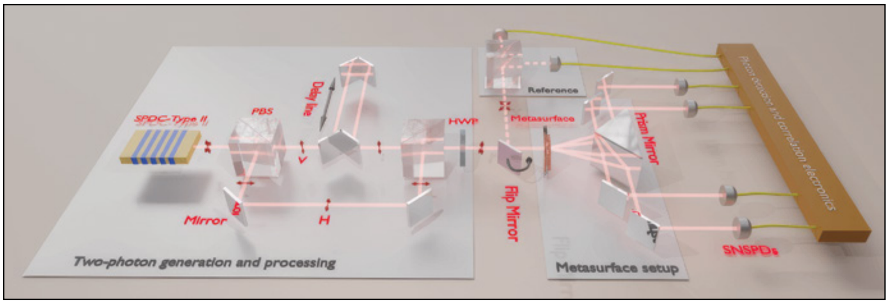
Optics researchers in the Harvard John A. Paulson School of Engineering and Applied Sciences (SEAS) did just that. The research team led by Federico Capasso, the Robert L. Wallace Professor of Applied Physics and Vinton Hayes Senior Research Fellow in Electrical Engineering, created specially designed metasurfaces — flat devices etched with nanoscale light-manipulating patterns — to act as ultra-thin upgrades for quantum-optical chips and setups.

The research was published in Science and funded by the Air Force Office of Scientific Research (AFOSR).

Capasso and his team showed that a metasurface can create complex,



The image features an artistic representation of metasurface quantum graphs. (Image: Joshua Mornhinweg)



Schematic depiction of metasurface-based optical setup in the lab. (Image: Harvard University)

entangled states of photons to carry out quantum operations – like those done with larger optical devices with many different components.

"We're introducing a major technological advantage when it comes to solving the scalability problem," said graduate student and first author Kerolos M.A. Yousef. "Now we can miniaturize an entire optical setup into a single metasurface that is very stable and robust."

Metasurfaces: Robust and Scalable Quantum Photonics Processors

Their results hint at the possibility of paradigm-shifting optical quantum devices based not on conventional, difficult-to-scale components like waveguides and beam splitters, or even extended optical microchips, but instead on error-resistant metasurfaces that offer a host of advantages: designs that don't require intricate alignments, robustness to perturbations, cost-effectiveness, simplicity of fabrication, and low optical loss. Broadly speaking, the work embodies metasurface-based quantum optics which, beyond carving a path toward room-temperature quantum computers and networks, could also benefit quantum sensing or offer "lab-on-a-chip" capabilities for fundamental science.

Designing a single metasurface that can finely control properties like brightness, phase, and polarization presented unique challenges because of the mathematical complexity that arises once the number of photons and therefore the number of qubits begins to increase. Every additional photon introduces many new interference pathways, which in a conventional setup would require a rapidly growing number of beam splitters and output ports.

Graph Theory for Metasurface Design

To bring order to the complexity, the researchers leaned on a branch of mathematics called graph theory, which uses points and lines to represent connections and relationships. By representing entangled photon states as many connected lines and points, they were able to visually determine how photons interfere with each other, and to predict their effects in experiments. Graph theory is also used in certain types of quantum computing and quantum error correction but is not typically considered in the context of metasurfaces, including their design and operation.

The resulting paper was a collaboration with the lab of Marko Lončar, whose team specializes in quantum optics and integrated photonics and provided needed expertise and equipment.

"I'm excited about this approach, because it could efficiently scale optical quantum computers and networks — which has long been their biggest challenge compared to other platforms like superconductors or atoms," said Research Scientist Neal Sinclair. "It also offers fresh insight into the understanding, design, and application of metasurfaces, especially for generating and controlling quantum light. With the graph approach, in a way, metasurface design and the optical quantum state become two sides of the same coin."

This article was written by Anne Manning for Harvard University. For more information, contact Anne, amanning@seas.harvard.edu.

Product Spotlight

MULTIPHYSICS MODELING AND SIMULATION APPLICATIONS

COMSOL Multiphysics® is a software environment for creating physics-based models and standalone simulation apps. Add-on products provide specialized functionality for electromagnetics, structural, acoustics, fluid flow, heat transfer, and chemical simulations. Interfacing products offer a unified workflow with all major technical computing and CAD tools. COMSOL Compiler™ and COMSOL Server™ are used for deploying simulation applications to colleagues and customers. https://www.comsol.com/products

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Armored Multi-Purpose Vehicle Rapid Capability Kit Upgrades

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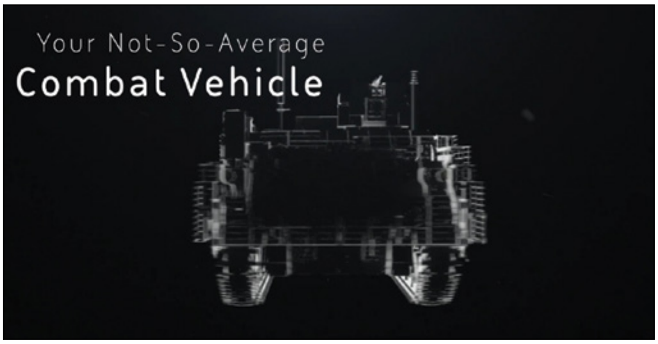

BAE Systems is investing in the Armored Multi-Purpose Vehicle (AMPV) to further expand capability options for soldiers. By using internal investment dollars and the modular chassis of the AMPV the company will collaborate to produce various technologically-advanced prototypes equipped with different capability kits. The various strategic agreements will drive combat vehicle innovation for warfighters at speeds that outpace the adversary.

"The AMPV is a proving ground for the future of tracked ground combat," said Bill Sheehy, Ground Maneuver Product Line Director for BAE Systems. "The brand-new platform is coming off a hot production line, and the proven hull is one of the most durable building blocks being delivered to the U.S. Army today. We're committed to working alongside other technology disruptors at a pace that enhances AMPV's capability options now, so it's available for soldiers in a moment's notice."

The capability kits will feature integrated effectors that would allow soldiers to perform missions including counter-unmanned aerial systems detection and targeting, ground autonomy and unmanned turrets – all while maneuvering within the highly-survivable AMPV. In just the last two years, BAE Systems has invested in similar integration efforts, having installed and showcased five different turreted prototypes — to include a Modular Turreted Mortar and 30mm unmanned weapon systems — all using a modular open systems and collaborative approach to enhance the platform.

"We have a lot of work ahead of us for what we've set out to do this year, but just like a formation operating on the battlefield, collaboration fuels success," Sheehy said. "This might not be a traditional approach to innovating for warfighters, but the AMPV isn't your average combat vehicle either."

BAE expects to announce its industry partners and further details about the capability kits later this year.

www.baesystems.com

TRML-4D Radar for Ukrainian Air Defense

Hensoldt
Taufkirchen, Germany
nico.fritz@hensoldt.net
www.hensoldt.net

Hensoldt recently received a major order to supply radars to strengthen Ukraine's air defense. As part of a comprehensive order package worth more than 340 million euros, TRML-4D high-performance radars and SPEXER 2000 3D MkIII short-range radars will be delivered.

The TRML-4D is based on the latest Active Electronically Scanned Array (AESA) radar technology. It ensures the rapid detection and tracking of around 1,500 targets within a radius of up to 250 km. It is capable of quickly and reliably detecting, tracking and classifying all types of air targets – cruise missiles, drones, aircraft and helicopters.

The SPEXER radar family offers surveillance radars for various ranges for the automatic detection and classification of ground, sea and low-flying air targets. The SPEXER 2000 is part of the new Skyranger 30 cannon-based air defense vehicle from Rheinmetall. It is also used in the German c-UAS Feldlager (ASUL), qualified air defense, and high-energy laser for drone defense (HoWiSM).

Hensoldt has decades of experience with radar systems for air defense and is actively driving forward the further development of key technologies in this field. In addition to the TRML-4D and SPEXER, the company's portfolio includes the Twinvis passive radar and radars for securing ship and air traffic. Both the TRML-4D and the SPEXER are part of the 'Near and Very Short Range Air Defense System' (NNbS) ordered by the German Armed Forces.

www.hensoldt.net

The World's Largest Real Time EW Test Range

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The U.S. Department of Defense faces an increasingly complex electromagnetic environment, in which rapid advances in radar and electronic warfare (EW) demand new tools for development, testing, and training. DARPA's Digital RF Battlespace Emulator (DRBE) program took up this challenge, resulting in the development of the world's largest high-fidelity, real-time virtual radio frequency (RF) test range – enabling previously unachievable scale and realism in the emulation of EW scenarios.

Unlike traditional modeling, simulation, and open-air testing approaches, the DRBE system allows for the complex interaction of synthetic RF entities simultaneously, all within a fully software-defined environment. This offers a powerful new tool for testing AI-enabled EW capabilities and accelerating the development of next-generation RF systems.

"DRBE is a leap forward in how we can prepare and equip RF systems against sophisticated adversaries," said Anna Tauke-Pedretti, Ph.D., DRBE Program Manager in DARPA's Microsystems Technology Office. "DRBE is not only setting a new benchmark for real-time simulation but is also accelerating our ability to develop and refine advanced electronic warfare capabilities that keep pace with emerging threats."'

At the heart of DRBE is a real-time high-performance wafer-scale computing architecture, or "Real-Time HPC," powered by the world's largest processor. This compute system delivers massive throughput with ultra-low latency, a critical requirement for simulating complex RF engagements with the timing precision needed for modern EW tactics.

The first DRBE system will transition to a U.S. Navy lab in late 2025, where it will be integrated into the Defense Department's testing and evaluation infrastructure.

"DRBE is a catalyst, redefining the scale at which we can develop EW payloads and address complex challenges. It empowers our lab to craft solutions with unprecedented sophistication, significantly boosting our confidence in the effectiveness and reliability of our products," said Jenifer Koch, Chief Technologist, Aircraft and Spectrum Integration Environments, U.S. Navy.

www.darpa.mil

Vulcan Rocket Completes First National Security Launch for Space Force

U.S. Space Force
El Segundo, CA
sscpa.media@spaceforce.mil
www.spaceforce.mil

United Launch Alliance's (ULA) Vulcan Centaur V rocket recently completed its first National Security Space Launch (NSSL) mission for the U.S. Space Force (USSF). On Aug. 12, the next generation rocket lifted off from Cape Canaveral Space Force Station, Florida, carrying the USSF-106 mission into geosynchronous Earth orbit (GEO).

Spacecraft separation, signaling mission success, occurred approximately seven hours after liftoff into geosynchronous Earth orbit (GEO).

The USSF is leveraging the newly certified Vulcan Centaur rocket to deliver demonstrations and experiments to geosynchronous orbit on behalf of Department of Defense customers. The experiment flying on USSF-106, the Navigation Technology Satellite-3 (NTS-3), is an Air Force Vanguard project led by the Air Force Research Laboratory (AFRL) and built by L3Harris Technologies. It leverages a secondary payload adapter which demonstrates resilient satellite navigation through flexible reprogrammable signals, an electronically steerable antenna, and advanced timekeeping algorithms. NTS-3 is the first U.S. integrated navigation satellite experiment in nearly 50 years, since NTS-1 and NTS-2 paved the way for the current GPS constellation.

"It's an exciting day for us as we launched the first NSSL flight of Vulcan, an outstanding achievement for United Launch Alliance and the nation's strategic space lift capability. This is an important milestone for the Space Force and all involved," said Col. Jim Horne, USSF-106 Mission Director. "After years of development, technical collaboration, and dedication by all involved, including our government mission partners and the entire ULA team, I'm proud to say the first Vulcan NSSL mission delivered its payloads safely into space."

Standing at 202 feet tall and weighing 1.74 million pounds, the Vulcan configuration is enabled by the powerful Centaur V upper stage, which has 2.5 times the energy and 450 times the endurance of its predecessors, according to ULA. The company's Vulcan rocket is offered in four standard configurations, including zero, two, four and six solid rocket booster variants. Vulcan's main engine booster propulsion is powered by a pair of BE-4 engines, manufactured by Blue Origin, while Northrop Grumman supplies the Graphite Epoxy Motor (GEM) 63XL solid rocket boosters for Vulcan.

www.spaceforce.mil

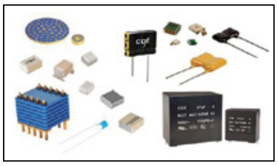
New Products

Protection Thyristor in DO-214AB Package

Littelfuse, Inc. (Rosemont, IL), announced the launch of the Pxxx0S3H SIDACtor® Protection Thyristor Series, the industry's first 2 kA surge protection component in a DO-214AB (SMC) package. This compact solution offers robust defense against severe transient events while enabling product miniaturization — ideal for next-generation power and energy designs. The Pxxx0S3H Series is purpose-built for AC and DC power lines in demanding environments. It provides exceptional surge immunity for applications such as industrial power supplies, automotive battery charging systems, solar inverters, UPS/AC distribution systems, and ICT equipment.

www.littelfuse.com

High Performance DC Link Capacitors



Knowles Corporation (Itasca, IL), announced its Cornell Dubilier brand is expanding its portfolio with Type BLS 125°C DC-Link Capacitors for harsh environments. These capacitors are designed to outperform competitors by offering a 100 percent longer lifespan under rigorous THB testing. Rated up to 125°C, Type BLS capacitors undergo 2,000 hours of THB testing at 85 °C and 85 percent relative humidity while operating at rated voltage. "Reliability is critical in harsh environments, and we're addressing that challenge head-on with our Type BLS capacitors," said Chris Kelly, Product Manager at Cornell Dubilier. "We're providing a solution that not only meets, but surpasses, automotive-grade standards like AEC-Q200."

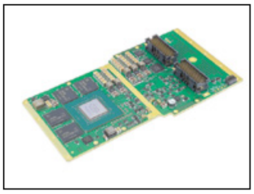
www.knowles.com

A230 Vortex AI GPGPU Supercomputer

Aitech (Chatsworth, CA) announced the Aitech A230 Vortex AI GPGPU supercomputer, a first-of-its-kind AI-on-the-edge solution. Designed to support military operations across all environments, the A230 is available in both conduction- and forced-air-cooled-variants, making it suitable for sea, land and air platforms. Its counterpart, the S-A2300 is radiation-tolerant and specifically designed for operation in harsh Low Earth Orbit (LEO) space environments. The A230 Vortex offers AI-on-the-edge computing with near-real-time pattern of life analysis and actionable intelligence, enabling smarter decision-making and optimizing the Observe, Orient, Decide, Act (OODA) loop, even in contested and disconnected environments.

www.aitechsystems.com

Condor NVB2000xX and Condor NVB500xX XMC Cards



EIZO Rugged Solutions Inc. (Orlando, FL) announced the release of two advanced XMC form factor video graphics and AI GPGPU Co-processor cards built on NVIDIA RTX PRO™ 2000 and RTX PRO 500 Blackwell Generation GPUs. The new Condor NVB2000xX and Condor NVB500xX are ideal for bringing real-time edge processing and embedded AI applications to existing CPU processors found in mission-critical environments. These compact, low-SWaP solutions deliver cutting-edge AI Inference acceleration and video processing and display capabilities in a rugged XMC form factor, making them ideal for space-constrained platforms such as ISR pods, ground vehicles, and uncrewed aircraft.

www.eizorugged.com

EMI Test Interference Receiver

Keysight Technologies (Santa Rosa, CA) announced a major enhancement to its PXE Electromagnetic Interference (EMI) Receiver, extending the wideband Time Domain Scan (TDS) with a real-time, gapless measurement capability up to 1 GHz measurement bandwidth. The new PXE Receiver enables engineers to measure from 30 MHz to 1 GHz in just one step versus the previous three-step version. This advancement provides high sensitivity, enables faster diagnostics, and significantly accelerates electromagnetic compliance (EMC) and certification workflows.

www.keysight.com

SOSA Aligned 3U VPX GPU Module

Curtiss Wright Corp. (Ashburn, VA) introduced the industry's highest performance SOSA aligned 3U VPX GPU module. The rugged VPX3-730, featuring the NVIDIA RTX PRO 5000 Blackwell GPU, is the newest member of Curtiss-Wright's industry-leading Fabric100™ complete end-to-end ecosystem of VPX system building blocks that deliver proven interoperability and reduce system integration risk. For inferencing applications, NVIDIA Blackwell architecture represents a major leap forward in artificial intelligence (AI) / machine learning (ML) and vector processing compute capacity and memory bandwidth capabilities over prior-generation GPUs, and delivers up to 15x higher performance compared to other accelerated computing solutions.

www.curtisswrightds.com

Relio R1 Edge Computer

Sealevel Systems (Liberty, SC) announces the release the Relio R1 Edge, the latest addition to the industry-leading Relio embedded computer line. The R1 Edge incorporates the newest generation of industrial processors and a modernized video interface. With versatile communication options like 2.5 Gigabit Ethernet, Cellular 4G LTE, Wi-Fi 6E, and RS-232/422/485, the R1 Edge features a USB C port, locking USB 3.1 ports, locking USB 2.0 ports, DisplayPorts, Audio Line-In/Out 3.5mm ports, and a wide operating temperature range of up to -40°C to +71°C. "With its powerful Intel Core processors, robust and diverse connectivity options, and ruggedized design, the R1 Edge is built to handle the complex challenges of today's, and tomorrow's, industrial, military, and aerospace applications, enabling our customers to connect faster, compute smarter, and scale at the edge," said Jeff Baldwin, Director of Engineering at Sealevel.

www.sealevel.com

70 kW Power Laser Sensor

MKS Inc. (Andover, MA), a global provider of enabling technologies that transform our world, has announced the enhanced Ophir® 70K-W Ultra-High Power Laser Sensor at Laser World of Photonics 2025. Designed to meet the stringent demands of industrial and defense environments, the enhanced Ophir 70K-W sensor delivers precise CW laser power measurements up to 70 kW. Now featuring a unique Power from Pulse™ capability, it enables accurate power measurements from short-duration laser exposures - extending measurement capacity up to 100 kW. This breakthrough makes it exceptionally well-suited for High Energy Laser Weapon Systems (HELWS), where lasers typically operate in fast, high-energy bursts.

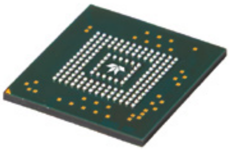
www.mks.com

Precision GNSS M.2 Card

Septentrio, part of Hexagon, a leader in high-precision GNSS positioning solutions, is collaborating with Gateworks Corporation, a U.S.-based manufacturer of single board computers. Gateworks (San Luis Obispo, CA) is now bringing its first Septentrio-based product to market, the GW16160, a new M.2 card which provides reliable high-accuracy positioning powered by the mosaic-X5 GNSS module. The mosaic-X5 module is a multi-frequency, multi-constellation receiver renowned for its high level of resilience to GNSS jamming and spoofing thanks to the built-in AIM+ (Advanced Interference Mitigation) technology. It also features a suite of GNSS+ algorithms that ensure robust positioning of rugged systems operating in challenging industrial environments. The GW16160 card with mosaic-X5 is a high-quality positioning solution for edge devices, including autonomous robots, UAVs and industrial mission-critical applications.

www.gateworks.com

eMMC 5.1 Module



Teledyne HiRel Semiconductors (Milpitas, CA) announced the release of their industrial-grade embedded MultiMediaCard (eMMC) module. Featuring 128GB of eMMC 5.1-compliant storage in a compact 153-ball FBGA package, this device is engineered to deliver reliable, high-speed performance in harsh environments. Qualified over the industrial temperature range of –40 °C to +85 °C, this eMMC module is well-suited for embedded applications in aerospace, defense, industrial automation, and ruggedized edge computing. Its integrated controller handles wear leveling, bad block management, and error correction (ECC), ensuring long-term data integrity and simplified system integration.

www.teledyne-ade.com

Cooled Infrared Cameras

LightPath Technologies, Inc. (Orlando, FL) announced its subsidiary G5 Infrared ("G5"), a leading high-end infrared camera systems manufacturer, has modified production of two high-end cooled infrared camera products, redesigned to utilize LightPath's Proprietary BlackDiamond™ Glass in place of Germanium. Following the acquisition of G5 in early 2025, the company commenced the redesign of select entry-level camera models to leverage BlackDiamond™ Glass and eliminate the use of Germanium. Export restrictions on Germanium imposed by China, which supplies a significant portion of the world's Germanium, is leading the shift away from Germanium by defense contractors of the U.S. and its allies.

www.lightpath.com

StreamCaster MANET Radios

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Silvus Technologies (Los Angeles, CA) announced a strategic partnership with Comdex, a premier systems integrator for mission-critical communications. The collaboration will expand nationwide access to Silvus' StreamCaster Mobile Ad Hoc Network (MANET) radios to state, local, and federal agencies. The Silvus family of StreamCaster MANET radios are engineered to operate independently of traditional communications infrastructure, deliver high-fidelity video, voice and data communications with class-leading output power, range, and mobility. At the heart of every StreamCaster MANET radio is Silvus' leading-edge MN-MIMO waveform technology that creates a self-healing, self-forming, and adaptive mesh network – capable of linking hundreds of nodes with unmatched data rate throughput, EW resiliency, and scalability.

www.silvustechnologies.com

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October 2025, Volume 10, Number 8

Upcoming...

Webinars

Estimating Surface Heating of an Atmospheric Reentry Vehicle with Simulation

COMSOL

Thursday, October 23, 2025 at 2:00 pm U.S. EDT

The Low-Earth Orbit Flight Test of an Inflatable Decelerator reentry vehicle launched to low-Earth orbit aboard a rocket in 2022. Its aeroshell, the largest Hypersonic Inflatable Aerodynamic Decelerator ever flown, was inflated to its full 6-meter diameter before successful reentry into the atmosphere. This 60-minute webinar will discuss how the temperatures measured by thermocouples during flight were used to estimate the surface heat rate across the aeroshell throughout the period of reentry.

Speaker:

Hannah Alpert, Ph.D..
Aerospace Systems Engineer,
NASA Ames Research Center

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Power distribution networks are the silent backbone of today's high-performance designs. As voltages shrink and switching speeds rise, even small variations in power delivery can lead to instability, jitter, or outright system failure. But making accurate power integrity measurements isn't always straightforward — engineers face challenges such as probe loading, noise floor limitations, and capturing fast transient events. This 60-minute webinar explores essential building blocks of power integrity testing.

Speaker:

Cameron Lowe
Field Applications Engineer,
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Soar to New Heights: Simulation-driven Design for Safety in Electrified Aircraft Systems

GAMMA TECHNOLOGIES

In the evolving landscape of aircraft electrification and progress towards advanced air mobility, safety has never been more paramount. Predicting the possibilities of various fault scenarios in a comprehensive manner from a system's perspective while ensuring faster time to market and achieving certification objectives is a delicate balance. This 45-minute webinar explores how advanced simulation software can effectively pressure test a wide range of mission scenarios.

Speakers:

Jonas Verrière, Ph.D.
Staff Engineer,
Gamma Technologies

Felix Brenner
Senior Application Engineer,
Gamma Technologies

Please visit www.techbriefs.com/webinar555

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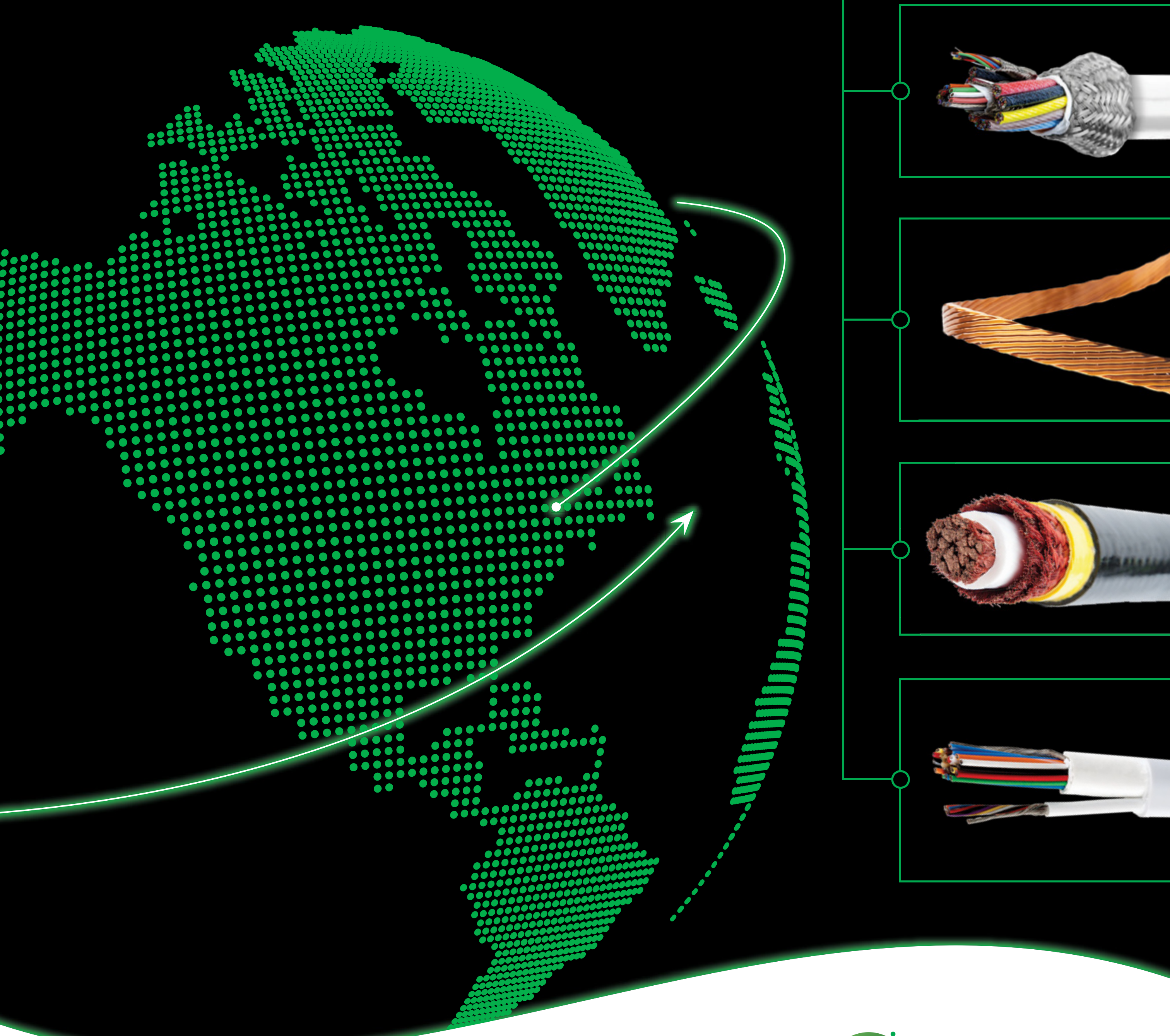

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